Chemical Age

I E A EXHIBITION PREVIEW (page 757)

VOL. 77 No. 1973

4 May 1957

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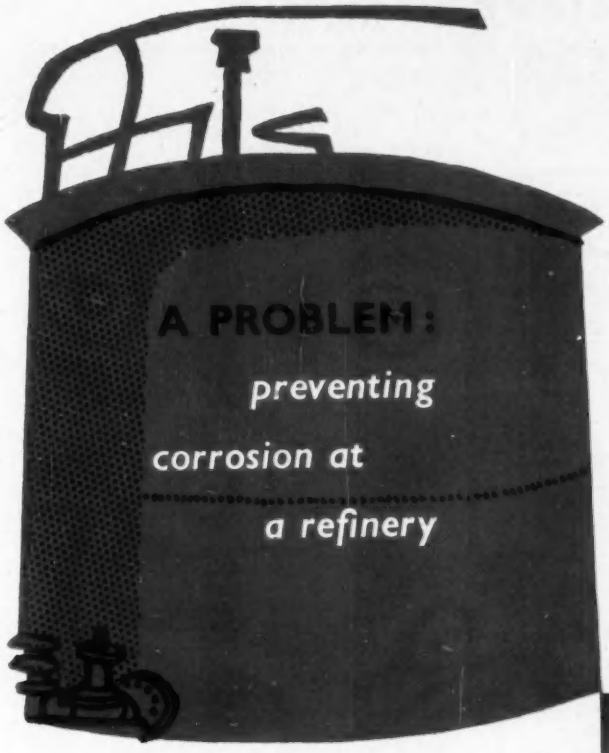
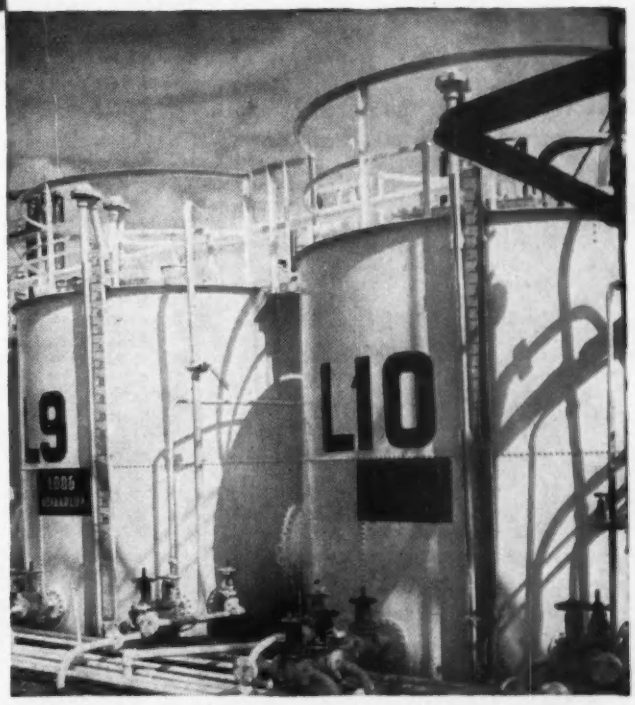


The modern oil refinery, with its attendant large-scale chemical production, raises many problems of protection against corrosion. To atmospheric corrosion are added the destructive effect of moisture, sulphuric acid, olefines, caustic and other materials.



THE ANSWER:

a paint that lasts for years

At Pernis refinery near Rotterdam, as at other Shell refineries, the answer has been found in a paint of exceptional protective power. The caustic vessels illustrated are only a small part of the complex installation at Pernis, now protected by paint based on Epikote Resins—the epoxy resins developed by Shell. These resins possess exceptional resistance to chemicals as well as superior adhesion, toughness and flexibility and are able to withstand conditions which would destroy ordinary coatings in a matter of weeks.

Ask your usual paint supplier about Epikote Resins. The more severe the conditions, the more effective and cost-saving is the protection they offer

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Divisional Sales Offices: LONDON, BIRMINGHAM, MANCHESTER, GLASGOW, BELFAST, DUBLIN.

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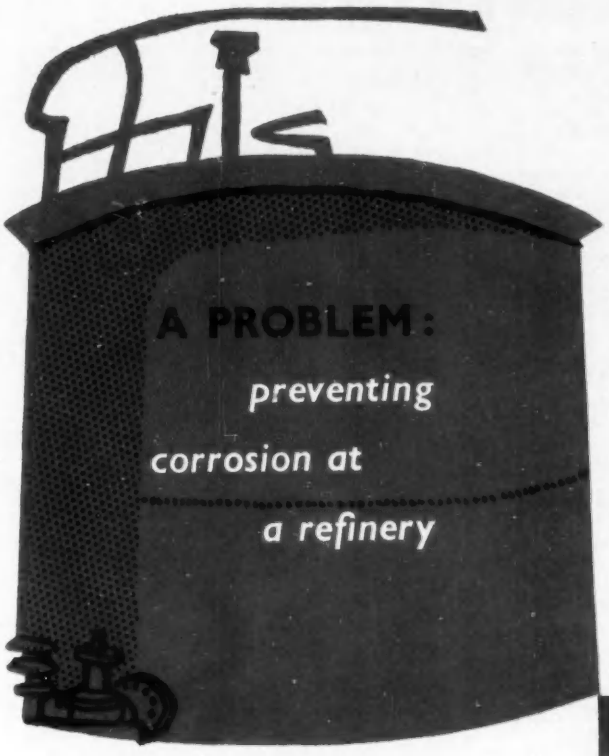

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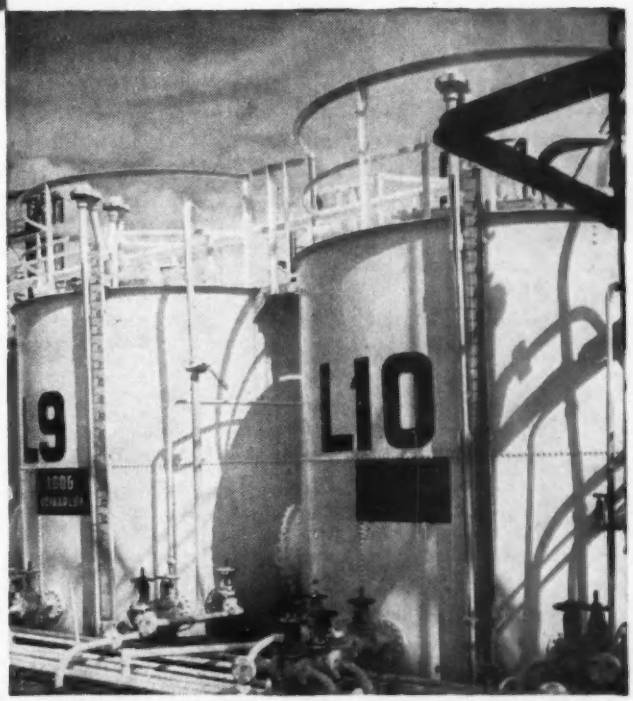

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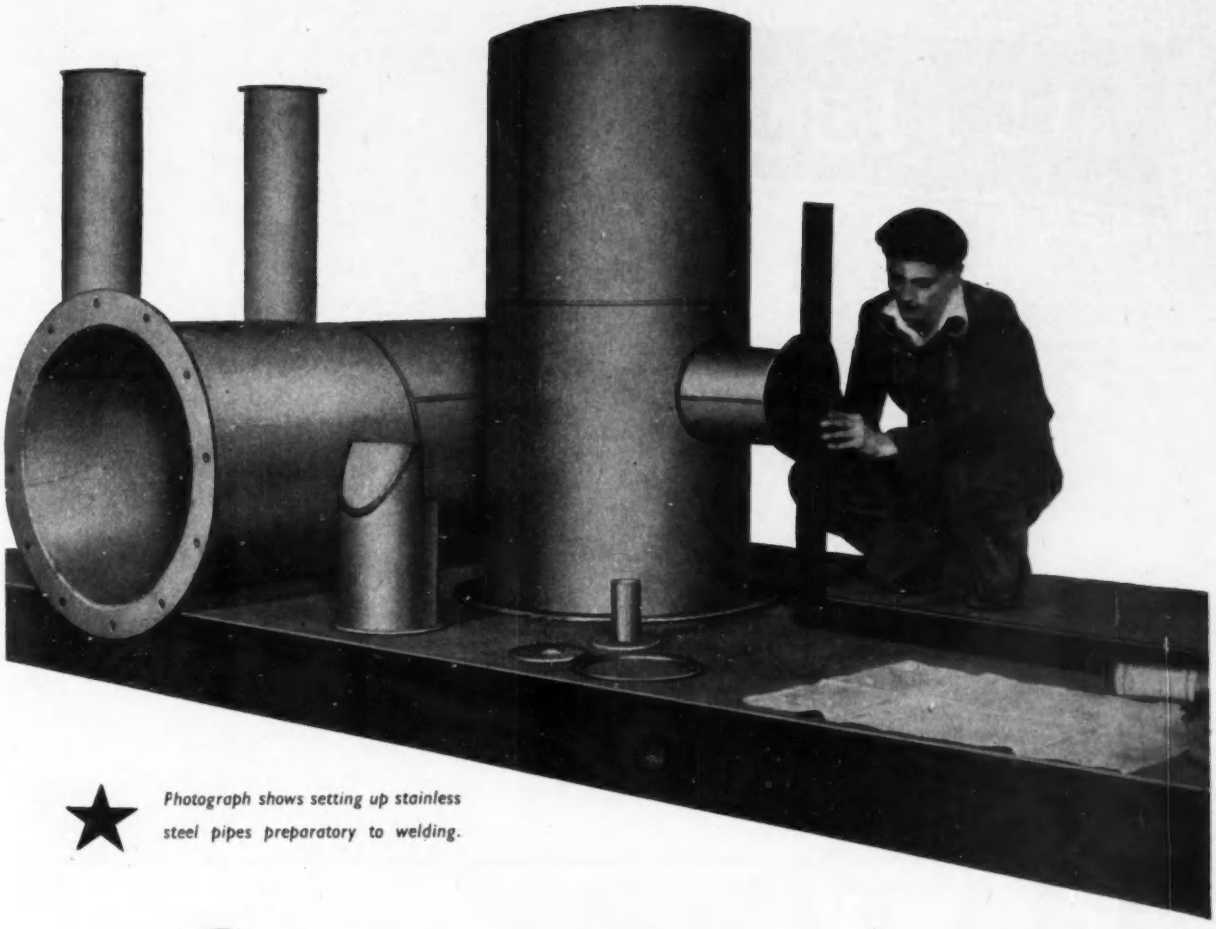

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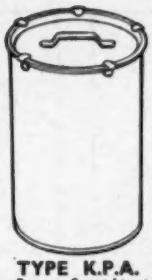

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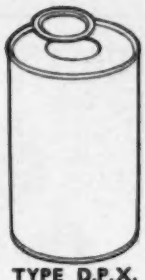

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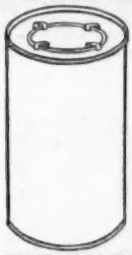

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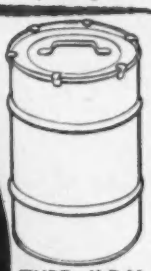

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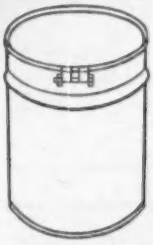

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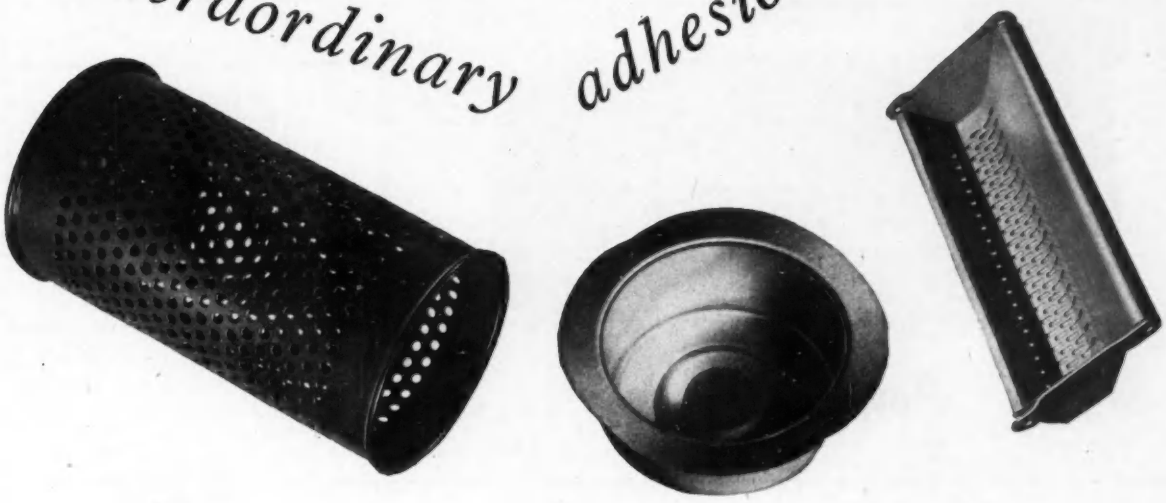

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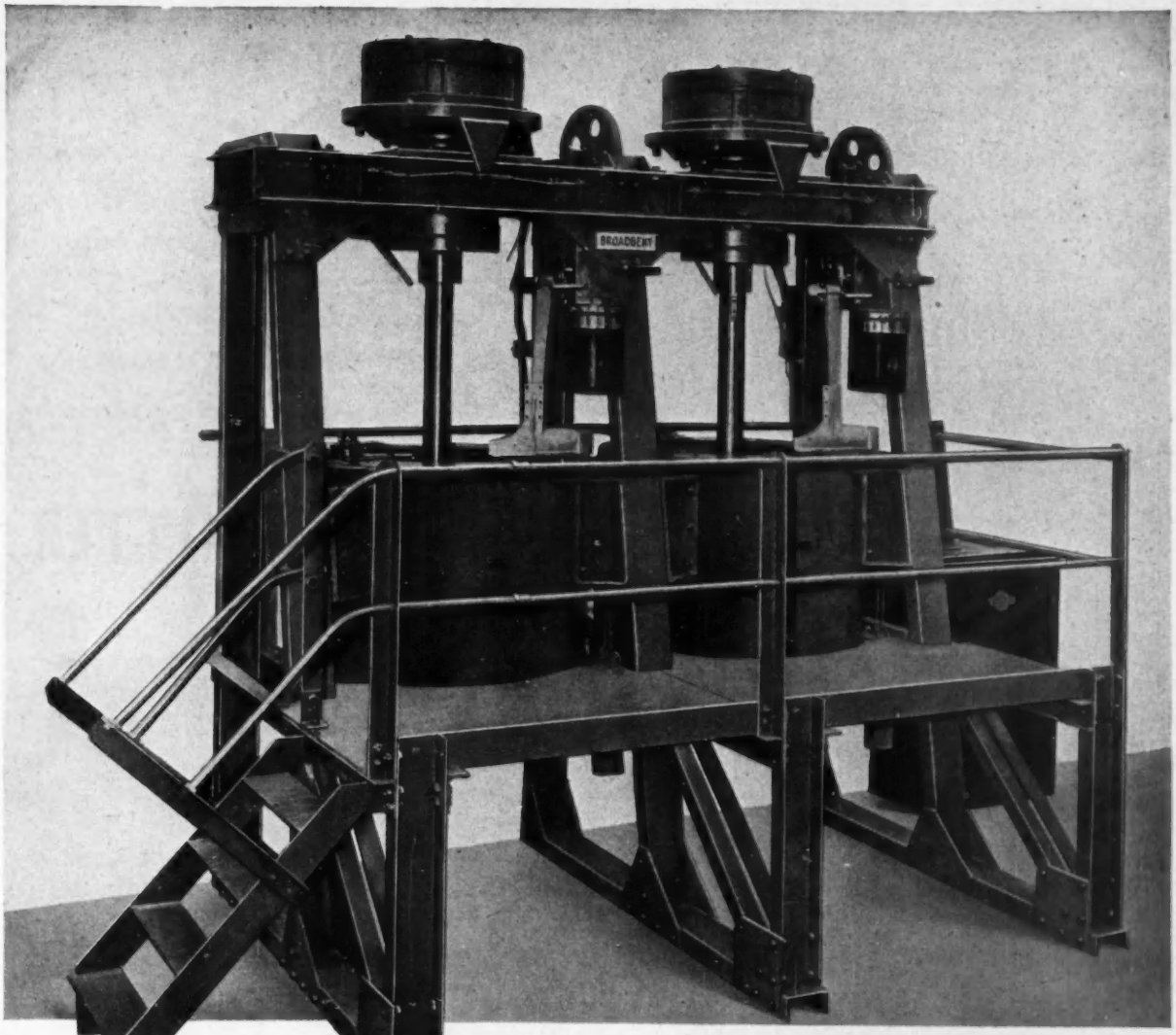

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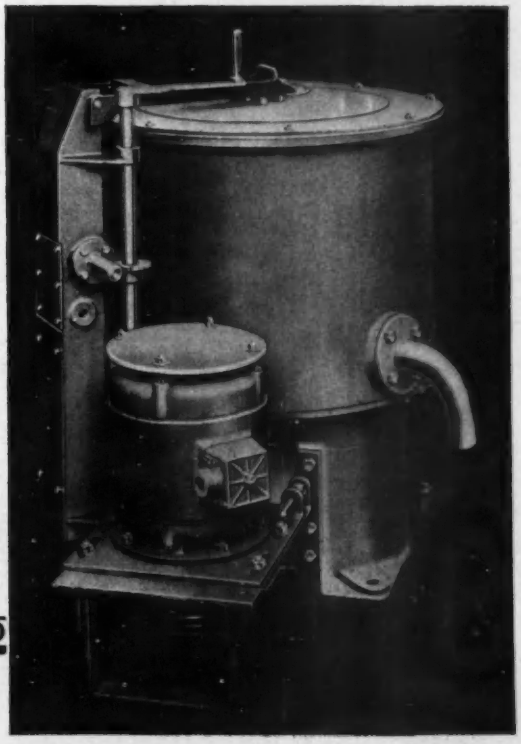

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IN THIS ISSUE

Annual subscription is 52s 6d ($7.40), single copies 1s 3d (by post 1s 6d).

PROFIT MARGINS

ANNUAL REPORTS for chemical companies for 1956 published recently show that despite record sales increases over 1955, margins of profit have been lower. Only last week, Imperial Chemical Industries announced that group income for 1956 is about six per cent down on the year at £50.1 millions compared with £53.6 millions the year before. Two reasons advanced for the fall in profits were: increased costs had not been passed on in selling price and the holding price of certain non-ferrous metals had fallen. Consolidated sales of this company, however, were £24 million higher at £435 million and established a new record.

Two large concerns on the pharmaceutical chemical side, Evans Medical Supplies and British Drug Houses show this same trend, Evans Medical having lower profit margins despite increases in sales, while British Drug Houses have sustained a 17 per cent fall in group gross profits. In the case of Evans Medical, high depreciation charges, and cost of transferring a plant constituted a disproportionate burden on 1956 profits. No explanation has been given for the fall in BDH profits, although this is believed to be due to the familiar pressure of rising costs. In 1955, the company's chairman said that wage and salary increases, of £114,000 had been absorbed and a further increase of more than that amount was anticipated in 1956. Berks' also mentioned salary increases in connection with their fall in profits (see page 770). Other chemical companies have also ascribed lower profits to rising costs.

Costs of raw materials, packaging materials, freight charges and wages scales, etc., have continued to rise during the first four months of 1957, and it is not considered that there will be any great change in the present pattern throughout 1957.

Apart from rising costs, the chemical industry has on the whole remained relatively free of economic setbacks, but the reduced motor production in the last half of 1956 and during the first part of this year, is likely to have affected it.

It is believed that the pattern for the chemical industry in 1957 is now set. Sales will have to be maintained in the face of growing competition. Any change in a large major chemical consumer could also have noticeable effect. It may well be that this country will see more agreements between chemical concerns or between chemical company and allied producers. Diversification of products in US chemical industry is reported as enhancing stability.

Present trends indicate that most spectacular results will be featured in the production of plastics, resins and synthetic fibres and in the considerable expansion of the special metals, such as niobium, tantalum and titanium which are used in nuclear projects.

Petrochemicals and pharmaceuticals should, from all accounts, make noteworthy progress and developments in the agricultural chemical industry are not lacking. It is clear, however, that all these expansion programmes rely heavily on research in the chemical industry. New products are of great importance since they can provide companies with substantial profit margins.

The importance of research was dealt with at considerable length by Lord Heyworth in his annual statement a week ago as chairman of Unilever Ltd. As Lord Heyworth remarked, it is by improving methods and processes and reducing the costs of manufacture that products are brought within the range of new customers and markets are thus expanded.

Recently, too, the American Association for the Advancement of Science gave striking estimates about the importance of scientific research to industry. Thus, it is claimed that 30 to 40 per cent of sales by the largest US chemical companies in 1956 were attributable to products developed within the past ten years and for every dollar spent on research during the last 25 years, US industry as a whole gets back between $20 and $50. Unfortunately, the place of research in UK economy is not yet known, but of late years it has been gaining ground in importance.

While scientific research is now playing an ever-important role in economy, little attention is paid to the value of market research except in the case of the larger concerns. Lord Heyworth stressed particularly that the 'interplay of scientific research and market research must be close and continuous.' Indeed, Unilever attach so much importance to market research that no less than half their annual expenditure on scientific research and development is devoted to it.

The value of market research in the chemical industry may seem doubtful to some, but it is well worth noting that in the US extensive market research has been employed in connection with the future possibilities of polythene before production plants for the product were set up.

LP POLYTHENE RACE IN US

CHEMICAL companies in the US, now over the first hurdle of obtaining licences, or developing processes and tackling plant construction for low pressure polythene production, are faced with the task of getting on stream as soon as possible. It is estimated that by January 1958 at least seven US companies will be producing low pressure polythene. Test marketing in the US, at 47 cents per pound of the naturally coloured product, has revealed a favourable future for the product.

It will be recalled that a few months ago low pressure polythene was reported as being unsatisfactory for high pressure or severe duty conditions. The German company Hoerchst, prior to the development of their new grade pipe, received, in particular, unfavourable publicity on this score, and, indeed, polythene produced by the Ziegler method was being viewed with concern.

Ziegler agreements with interested companies are said to be of the type which supply basic information, but the individual company develops the process and its own know-how. It is in the preparation of the catalysts that difficulties have arisen.

Catalysts for the Ziegler process involve the reaction of titanium tetrachloride with alkylaluminium compounds. These tend to be fairly flammable, toxic, and removal from the polymer produced is difficult. All the companies using the Ziegler process have, therefore, had to carry out considerable development work.

It is perhaps significant that some of the companies using the Phillips process for preparation of low pressure polythene in the US are now on stream. The catalyst in this process is 2.5 to 3 per cent chromium as the oxide.

A third process for low pressure polythene is that of Standard of Indiana, US, which employs molybdenum oxide, or alumina, while R. S. Aries and associates claimed in Paris last December to have developed an improved low pressure process. He has stated that two companies holding Ziegler licences have signed agreements for his process.

Reliable estimates for polythene production in the US, suggest that by 1961, some 1,100,000,000 lb. will be produced, of which 400 million lb. will be of the high density type. Main uses for the 700 million lb. of low pressure polythene are suggested as film, wire and cable, blown bottles, pipe applications, moulded product coatings and monofilaments, in that order.

It is of course difficult at this time to judge the progress of other polyolefins and the effect that these might have on polythene production in the US or in the UK. It is considered likely in the US that other polyolefins will be available by 1959 or even 1958. Phillips Chemical Company of the US are reported to be already producing the copolymer, with five to 10 per cent propylene on a pilot-plant scale.

Montecatini of Italy has rights to Professor Natta's polyolefin developments and the company is already building a 13-million lb.-a-year plant at Fernara, Italy. In the US, however, there does not seem to be the same interest in polypropylene as there is in Europe. Another polyolefin which is thought to hold promise is polybutylene.

Much of the interest in polypropylene is believed to centre on price, for the starting material is propylene, now obtained as a waste material. With rising demand, the price would obviously rise, and by the time the product was in production, polythene prices would probably have dropped still lower.

GAMMA-BHC IN GERMANY

A DOMINANT position in Germany's use of insecticides is held by the gamma-isomer of BHC (benzene hexachloride)—gamma-BHC or lindane. In a recent account W. Madel and W. Biegel (*Agric. Chemicals*, 1957, 12, 3, 36) attribute much of this situation to the Colorado potato beetle. Attacks by this pest are rare in the UK, but its attacks in Europe are on a scale quite outside British experience. Before World War II Germany, the world's largest potato growing country, checked the beetle with calcium arsenate, calcium disulphide, and legislation to compel taking anti-beetle measures. During the war the defence against the beetle lapsed. By 1947 four-fifths of West Germany was infested with the beetle, and by 1950 the figure was 97 per cent.

German manufacture of BHC began in 1946 under great difficulties. By 1952 two and a half million potato acres were being sprayed and over half a million acres dusted with various insecticides including BHC. As is well known, crude BHC may give flavour taints to crop foods treated with it. However, the tainting problem was encountered less often than might have been expected. From 1948 onwards German research concentrated upon producing the more purified gamma-isomeric form; by 1950, a 99-100 per cent pure gamma-isomeric product was producible to which the name Lindane was applied. The purity standard of lindane today in Germany is around 99.5 per cent and the risk of tainting by this product is negligible. Lindane produces a more rapid action, compared with DDT and if rainfall follows spraying this stronger initial effect is of extreme importance.

Eighty-one different lindane formulations are official in West Germany today compared with 27 BHC products. Twenty combinations of lindane with DDT or Chlordane are also officially recognised. A number of combinations of lindane with other insecticides are listed officially—e.g., with dieldrin, toxaphene, DDT and dieldrin, and with organo-phosphorus materials.

The outstanding success of lindane with the Colorado beetle has encouraged its use in many other fields—as a seed dressing, in household aerosols, as a veterinary pesticide.

Although the development of BHC and of gamma-BHC as modern insecticides is associated far more with British research than that of any other country, it seems clear that in the German development of lindane American technical influence has been stronger—a probable consequence of heavy technical and economic aid in earlier occupation years.

PRINCE PHILIP BECOMES PATRON OF CHEMICAL ENGINEERS

Double Landmark for Institution

PRINCE Philip, Duke of Edinburgh, has become the first Royal Patron of the Institution of Chemical Engineers. This was announced by Mr. John A. Oriel, president, at the institution's annual dinner at the May Fair Hotel, London, on Tuesday. Mr. Oriel added that a message of loyalty and thanks had been sent to the Prince.

Mr. F. E. Warner, joint hon. secretary, read a reply from Prince Philip thanking members for 'their kind message of greeting which I much appreciate'. The Prince added that he was very pleased to become a patron of the institution and wished it all success in the future.

Lord Chandos, who proposed the toast of 'The Institution,' warmly congratulated it for having been granted a Royal Charter recently. He described the charter as a hallmark that the institution was in the forefront of national life.

At the end of the after-dinner speeches, Mr. Oriel installed Sir Hugh Beaver as president for 1957-58. The dinner was attended by a company of 280 members and guests among whom were:

Mr. J. M. Leonard, president and Mr. George Brearley, chairman, chemical engineering group, Society of Chemical Industry; Mr. H. F. Broad, general secretary, Science Masters Association; Sir Harold Roxbee Cox, Ph.D.; Dr. H. J. T. Ellingham, secretary, Royal Institute of Chemistry; Sir Alexander Fleck, chairman, ICI Ltd.; Lieut-Colonel F. J. Griffin, general secretary, Society of Chemical Industry; Mr. G. N. Hodson, chairman, and Dr. E. H. T. Hoblyn, director, British Chemical Plant Manufacturers' Association; Mr O. W. Humphreys, president, Institute of Physics; Dr. H. W. Melville, secretary, and Mr. J. Knox, chief scientific officer, DSIR; Sir Keith Murray, chairman, University Grants Committee; Professor J. E. Myers, Fulbright lecturer, Leeds University; Mr. G. F. Williams, chairman and Mr. J. Davidson Pratt, director and secretary, Association of British Chemical Manufacturers; Professor W. Wardlaw, president, Royal Institute of Chemistry.

Replying to the toast of the Institution, Mr. Oriel described the recent granting of the Royal Charter as a landmark in the history of chemical engineering not only in the UK, but throughout the Commonwealth. While wishing to show their gratitude to the Queen for this singular honour, members also felt a good deal of pleasure and a great deal of pride.

He reaffirmed his faith in chemical engineering and its service to mankind, saying, 'chemical engineering is making available in large quantities the necessities of life.'

Lord Chandos declared that almost every month new techniques, new processes and new ideas were being born in the brains of British scientists, engineers, physicists and chemists. Cumulatively, they could represent an enormous addition to man's control over the material world. He suggested that, 50 years from now, our social problem would have changed from one essentially of production to one essentially of organising our leisure. He believed that the chemical industry, and its sister, the electrical industry, would be in the forefront of all the progress that would be made during this century.

Concluding, Lord Chandos said that the teaching of science had to be made more attractive and that more of this country's young and imaginative people must be drawn into the embrace of the scientific world. In that, he felt sure the Institution of Chemical Engineers, with its Royal Charter, would play a leading part.

Proposing the toast of the guests, Mr. Oriel particularly welcomed the professors and students that were present from the Commonwealth and the US. Dr. R. P. Linstead, Rector of the Imperial College of Science and Technology, who replied, referred to the fact that the college had started the first course in chemical engineering as far back as 1885; the department of chemical engineering, set up 44 years ago, was the first and probably the largest of its kind. He spoke of the college's long and warm relationship with the institution and added that the college was this year celebrating the jubilee of its own Royal Charter.

Before installing Sir Hugh Beaver the new president, Mr. Oriel presented the 1956 and 1957 Osborne Reynolds Medals to Dr. J. M. Pirie, hon. editor, and Mr. P. K. Standring, charter committee chairman, respectively.

Progress in Petroleum Industry has Aided Development of Chemical Engineering

'THE RAPID development of the study of chemical engineering during the past 25 years has been due largely, almost entirely, to the development of the petroleum industry' said Mr. John A. Oriel giving the presidential address to the Institution of Chemical Engineers on Tuesday 30 April.

Taking as his subject 'Petroleum and the chemical engineer' Mr. Oriel reviewed the history of petroleum refining from the time when 35 years ago the petroleum industry found itself in need of large scale plant. Since that time, said Mr. Oriel, chemical engineering had been called upon to develop plant for the continuous preparation of fuels.

'It was, I suppose, the cracking process that really brought chemical engineering into its full flood in the petroleum industry' Mr. Oriel remarked. As a result of this process large quantities of unsaturated gases were produced. These gases now were the raw material for more than half the organic chemicals in the world.

Dismissing as 'unrealistic' the idea that coal and oil should be used only as chemical raw materials and not as fuels Mr. Oriel said that although we were using up petroleum reserves at a considerable rate there would be enough to meet increasing needs well into the next century. 'There is no doubt that the ingenuity of man will find other liquid fuels to replace petroleum products in the distant future when the necessity is really there.'

Before Mr. Oriel's speech the Institution held its 35th annual corporate meeting. The annual report of the council for the year ended 31 December 1956 states that the financial state of the Institution has not improved as compared with the previous year. The new h.q. in Belgrave Square proved more expensive to run than the previous quarters, there has been an exceptionally heavy expenditure on pamphlets giving information on training and qualifications in chemical engineering, and postal expenditure has risen considerably.

After the annual meeting, Mr. J. A. H. Walker was presented with the William Macnab Medal for the best set of answers submitted at the 31st associate membership examination. As Professor E. J. Sellers and his co-author, Dr. D. R. Augood, were abroad, there was no formal presentation of the Moulton Medal for 1956 awarded for their paper 'The distillation characteristics of liquid hydrogen'.

Fire Damages Monsanto's Polystyrene Plant

CONSIDERABLE damage was caused by a fire which broke out at the Monsanto Chemical Works at Newport, Mon, on 29 April. The cause of the fire is unknown. It started in a part of the factory devoted to the production of polystyrene and burned for 40 minutes before firemen using breathing apparatus could put it out.

No estimate of the cost of the damage is available, but Dr. D. H. Dyson, works manager, said later that the polystyrene plant would be out of action for about a week. The blaze, which broke out while a shift was changing over, was confined to one room.

It is the first serious fire to be suffered by Monsanto since they began production at Newport eight years ago. 'We were very lucky—it could have been much worse', said Dr. Dyson.

Will

MR. RALPH DEFRIES, vice-chairman and assistant managing director of BB Chemicals Ltd., Leicester, who died on 23 January, aged 62 years, left £21,669.

At the Graduates and Students Section dinner, l. to r., are C. F. Kearton, director Courtaulds, Mrs Kearton, Miss Hardie, D. B. Shearn, chairman of the section's Midland centre, H. W. D. Hughes, section honorary secretary, T. J. Norris, Miss P. Newsome and Miss M. Howatson

Graduate and Student Chemical Engineers Hold Annual Dinner

ANNUAL dinner of the Graduates' and Students' Section, Institution of Chemical Engineers was held at the Cora Hotel, London, on 26 April. Mr. D. J. Hardie (British Petroleum Ltd.), section chairman, presided.

D. J. Hardie, left (British Petroleum), section chairman, with Mrs. Coleman, and M. C. Coleman (Fischer and Porter)

Chief guest was Mr. C. F. Kearton who proposed the 'Graduates' and Students' Section'. Mr. M. C. Coleman, managing director of Fischer and Porter Ltd., replied. 'The guests' was proposed by Mr. D. B. Shearn, chairman of the Midland centre of the section, and Dr. W. Preston, hon. registrar of the Institution, responded.

Earlier on 26 April, the section held a symposium on 'The impact of atomic energy on chemical engineering'. Speakers included Dr. J. M. Fletcher, head of chemical processing group, AERE, Harwell, on 'Solvent extraction'; Mr. B. F. Warner, research manager at the UKAEA Windscale Works on 'The chemical processing of nuclear fuels'; Mr. L. D. Roland, senior chemical engineer of the Permutit Co. Ltd., on 'Ion-exchange applications in atomic energy'; and Dr. R. Roberts, technological irradiation group, AERE, Harwell, on 'Industrial utilisation of irradiation'.

24 per cent Increase in Chemical Industry Capital Spending

THE CHEMICAL and allied trades spent 24 per cent more in 1956 than they did in 1955 on fixed capital expenditure. This is stated in the 27 April issue of the *Board of Trade Journal*. The 1955 total figure, given at £101 millions, is based on provisional results of the 1955 production census and covers plant and machinery, vehicles and building work.

The average quarterly expenditure, based on a 1955 average of 100, during 1956, with 1955 figures in brackets, is given as: 1st quarter 110 (73); 2nd quarter 126 (94); 3rd quarter 134 (96); 4th quarter 167 (137).

Laporte Seek more Water

Laporte Chemicals Ltd., Baronet Works, Warrington, have applied to the Ministry of Housing and Local Government for a licence to site a new water borehole at Moss Side, Penketh, and to abstract from that and other existing boreholes more than 5,000,000 gals. a day.

SCI London Section Annual General Meeting

THE ANNUAL general meeting of the London section of the Society of Chemical Industry will be held at the Society's rooms, 14 Belgrave Square, London SW1, on 6 May at 6 p.m. Before the AGM the committee will appoint new officers of the section.

Three members of the committee, excluding the chairman, vice-chairman, secretary, assistant secretary and treasurer, will retire.

After the AGM a lecture entitled 'The combustion of coal' will be given by Dr. A. C. Monkhouse, director of fuel research, Fuel Research Station.

Vacuum Melting Equipment

Wild-Barfield Electric Furnaces Ltd., Elecfurn Works, Watford-by-Pass, are now making vacuum melting, heat-treatment and analysing equipment of approved NRC design, and not 'NC' design as stated in our issue of 6 April.

NEW PRESIDENT OF THE I.CHEM.E.

New president of the Institution of Chemical Engineers, who assumed his duties immediately after the annual corporate meeting on Tuesday this week, is SIR HUGH BEAVER, K.B.E., M.I.Chem.E., M.I.C.E. Managing director of Arthur Guinness, Son and Co. (Park Royal) Ltd., deputy president of the Federation of British Industries and a vice-president of the British Institute of Management, Sir Hugh joined the Institution in 1934.

Sir Hugh Beaver

Sir Hugh became assistant to Sir Alexander Gibb when in 1922 he established the now famous firm of consulting engineers of Sir Alexander Gibb and Partners. He became a partner in 1931 and his particular interest before the war was in developing the industrial engineering side of the firm. He was closely concerned with the measures for reindustrialisation of the depressed areas of South Wales, Tyneside and Durham and West Cumberland.

After serving as director-general of the Ministry of Works during the war, he joined Arthur Guiness, Son and Co. in December 1945, becoming managing director 11 months later. Since the war, Sir Hugh has been a member of the New Towns Committee and from 1954 to 1956 was chairman of the advisory council of the Department of Scientific and Industrial Research. Chairman of the Committee on Air Pollution, 1953-54, Sir Hugh is chairman of the Industrial Fund for the Advancement of Scientific Education in Schools.

Other officers elected were: vice-presidents: Dr. E. H. T. Hoblyn, G. U. Hopton (re-elected), H. P. Weber, Australia, A. S. White (re-elected); joint hon. secretaries (re-elected), F. E. Warner and R. C. Odams; hon. treasurer, F. A. Greene; ordinary council members, C. M. Auty, Professor E. S. Sellers, R. B. Southall, E. A. K. Patrick (associate).

OEEC MISSIONS CALL FOR POLLUTION RESEARCH LINK

Report on Pollution in Chemical Industry

RESEARCH in various countries of the world on air and water pollution is being duplicated and time and money squandered. There should be a better distribution of research work carried out at international level so that national organisations can concentrate more thoroughly and more effectively on the sectors for which they are best adapted.

That is among the conclusions reached in 'Air and Water Pollution, the position in Europe and the United States,' published by the European Productivity Agency of the Organisation for European Economic Co-operation (OEEC) and obtainable from HM Stationery Office, price 18s, 18s 6d by post.

The missions recommend that 'where international interests are involved, whether in connection with research or legislation, co-operation at the European level would be well worth-while'. In addition they call on OEEC to arrange a meeting, within six months of publication of the report, to be attended by representatives of OEEC countries to discuss the desirability of extending the scope of European co-operation and to make appropriate recommendations.

These two missions were set up following the proposal of the OEEC chemical products committee that a team of experts should study problems of air and water pollution caused by the chemical industry. A European mission was first formed to take stock of the present position in member OEEC countries and provide information on the basis of which a programme for a tour of the US could be drawn up.

Missions' Studies

Mission 136, on which seven countries were represented (Belgium, Denmark, France, Germany, the Netherlands, Portugal and the UK) studied air pollution and visited the US from June to August 1954. Mission 145 consisted of representatives of Austria, Belgium, France, Germany, Portugal, Sweden, the UK and the US. It visited Sweden, Germany, the Netherlands, Belgium, the UK and France during September to November 1953 and studied water pollution measures in those countries.

Technical and economic aspects of air and water pollution are given in the mission's comments and conclusions. The mission states that a satisfactory stage of development has not been reached for industrial effluents. However, most of the countries visited had found some effective and practical means of dealing with them. Regarding air pollution, Europe was found to be less advanced than the US 'owing to exceptionally intensive industrial activity in Europe'.

The cost of air pollution in the US (presumably in 1953-1954) is given as $1,500,000,000 a year and reference is made to the calculations of the Beaver Committee that air pollution was costing the UK £250 million a year.

It was noted that the US were expending much effort on the development of catalytic combustion and it was also observed that close attention was being paid by petroleum refineries to smokeless flaring of waste gas and avoidance of vapour loss from storage tanks and evaporators.

Careful attention is being paid in the US to siting of new industrial undertakings—account being taken of the character of the surroundings, local topography and prevailing weather conditions.

On the question of research, mission 136 reports that some US laboratories appeared to be undertaking identical types of research and that there was not always the same degree of specialisation as in Europe. The US spends more on research and development, but, the mission suggests that 'it is open to doubt whether it is more advanced in basic knowledge relating to pollution problems.'

Recommendations

Recommendations of the missions, based on technical and economic aspects are as follows:

Because of the complex and varied nature of air and water pollution, efforts to remedy them should be based on close co-operation between industrialists, technical specialists and the competent authorities.

Purification of mixed sewage and industrial effluents by municipal stations having proved successful, the missions recommend that these stations should be used wherever possible.

Sources of power and its generating equipment should be so chosen as to reduce or eliminate industrial nuisances.

Where a treatment plant can show an economic return by the recovery of some by-product previously going to waste, it is suggested that it is reasonable to insist on such a plant being built.

First approach to pollution, according to the missions, should be recovery of polluting matter for further use even if it results in a raw material which is cheaper to buy on the open market. However, this is often less costly than the full treatment required for discharge into air or water.

In this context, the report quotes the case of the Trail (Canada) Smelter. Damage to crops in the neighbourhood of the plant cost this company $350,000 in compensation payments. Utilisation of the sulphur dioxide in the waste gases produced 450,000 tons of ammonium sulphate in 1947.

On location of industries, the missions advise that sites should be chosen with due regard to facilities for disposing of liquid and gaseous effluents.

They recommend also that effluent involved should be passed to the nearest sewage treatment plant possibly during the night when the flow of sewage is at a minimum. Fullest consideration should be given to siting of a plant on the head waters of a river, on its middle reaches in a tidal estuary, or by the sea. Another factor is dilution.

The missions agree that standards are difficult to fix because of the differences between pollution problems and state that 'responsible authorities should impose no standards more severe than are necessary for safeguarding public health and amenities.' They also consider that for satisfactory solutions to international problems of air and water pollution, it may be desirable in some cases for inter-state legislation to be introduced.

Chemical Plants Visited

Part A of the report is devoted to water pollution. Chapter I gives details of legislation in some Western European countries, in the US, and on international agreements in Europe, the US and Canada. Chapter II deals with the missions' observations on general practice in Europe and the US and contains reports on plants visited. Such plants covered the chemical, pulp and paper, mining and ore, coal and coke industries, colliery spoilbanks, steam and power, oil, synthetic fibres, fermentation, milk, starch and beet sugar, and municipal plants. Lastly research in Europe is noted.

Chemical plants in Europe which were visited for examination of waste processing water were, Hüls Chemical Works, May and Baker Ltd., Bayer Dyestuffs Ltd., Monsanto Chemicals Ltd., Société Francaise des Matières Colorantes, Compagnie Francaise de Produits Industriels, and Société des Usines Chimiques Rhône-Poulenc.

Chapter III deals with legislation in connection with air pollution (Part B of the report) in some Western European countries and the US. In Chapter IV observations on general practice in the US are recorded and plants visited are listed. In this mission the plants inspected dealt with chemical miscellaneous industries, pulp and paper, and metallurgical industries, colliery spoilbanks, steam and power, oil, cement and synthetic fibres industries.

The chemical plants visited included National Lead Co., Titanium Division, the American Cyanamid Co., Shell Chemical Co., US, Hancock Chemical Plant, Union Oil Co., US, Hilton-Davis Chemical Co., Procter and Gamble Co.

Effects of air pollution on public health, agriculture, outside the factory (corrosion), and inside the factory are considered, as also meteorology and its application to pollution problems in the US. The chapter ends with an account of research work in Europe and the US. Appendixes on authorities; organisations; institutes; and plants visited in Europe, and in the US; members of the two missions, bibliography; and conversion tables are given at the end of the report.

DISTILLATES

★ THE CORROSION GROUP (Society of Chemical Industry) is 'now a happy band of pilgrims set out from the City of Destruction, if not yet in sight of the gates of uncorrodible gold.' That is the belief of Mr. T. Henry Turner which he is to express in his address as group chairman at the annual meeting on 7 May. Appropriately it is entitled 'A pilgrim's progress from corrosion.'

Mr. Turner believes members should all draw up an account of the troubles they have met, of the ways in which they have failed, and of any victories they have won; in the hope that like the story of Pilgrim's Progress 'it may help those who come after us.' According to his 35 years of fighting corrosion, few if any corrosion problems are permanently solved. 'Know-how and elbow grease, faith and discipline are essential for our salvation from the decay which is inherent in everything.'

★ THE GOSPEL of do-it-yourself has swept first the US and then Britain since the war, but few would have anticipated its extension to amateur prospectors of selenium. However, a special report ('A Field Test for Selenium,' 5328), just published by the US Bureau of Mines,' publications-distribution section, 4800 Forbes Street, Pittsburgh 13, Pa, explains how to assemble and use a 'simple' do-it-yourself kit for detecting this element.

Developed by research workers at the Bureau's Salt Lake City station, the equipment and methods are said to be 'so simple that a person unskilled in metallurgy or chemistry can detect the presence of minute amounts of selenium.' Equipment includes a source of heat (camp stove or blow torch), test tubes, crucibles, mortars and pestles.

It is recommended that the amateur selenium prospector should wear safety glasses. No wonder, for the four chemicals listed as essential for the tests are: potassium pyrosulphate powder, granular sodum peroxide, powdered tartaric acid, and sodium hydroxide pellets!

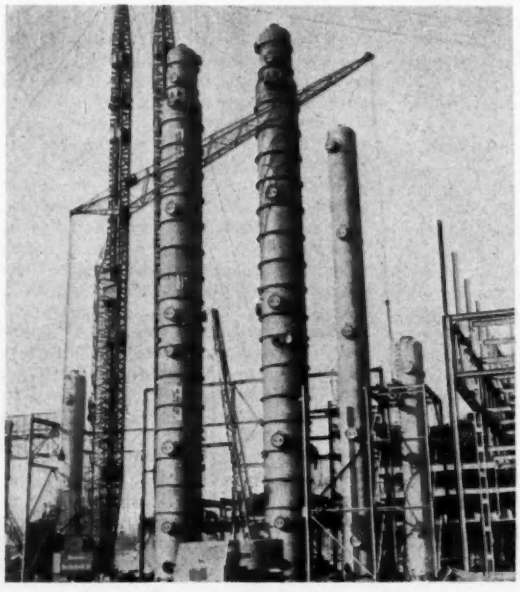
Said to be foolproof, the system was found capable of detecting as little as 10 parts per million of selenium in specimens. It is hoped that issue of this kit will lead to the discovery of a commercially important deposit.

★ WHERE does the money go? That question is answered by F. W. Berk and Co. Ltd., chemical manufacturers, whose annual report and accounts this year are accompanied by a special chart showing how each £1 of income is used. By far the biggest item is raw materials and goods for resale, which account for 15s; next come wages, salaries, pensions, holiday pay and insurance at 2s 4d; then maintenance, spares and maintenance supplies, 1s 4d.

Taxation absorbs 5d, depreciation 4d, fuel-oil, coal, coke, gas and electricity, 3d. At the bottom of the scale at 2d each are reserves and ploughed back into the business; and dividends.

★ ALEMBIC'S picture shows the towers that will form part of ICI's unique new oil gasification plant at Billingham. Unique because this series of processes (see CHEMICAL AGE, 9 March, page 417) has never been grouped together in the UK before for ammonia manufacture.

Although several millions have been spent on it, the plant will not displace the present method. Until gases are brought together in the synthesis plant, the two methods will be operated side by side. When completed, it will be the most highly instrumented plant at Billingham producing gases under pressure, cutting out some of the extensive compression operations in the present process.



These towers at the new Billingham plant are visible over a wide area of Tees-side

★ IN HIS early days in the industry, it was the chemist and not the chemical engineer who used the slide rule, said Mr. C. F. Kearton, a director of Courtaulds Ltd., chief guest at the annual dinner last week of the Graduates' and Students' Section, Institution of Chemical Engineers.

In an amusing after-dinner speech, Mr. Kearton recalled how in designing chemical plant, the chemist was versatile at reducing doodles on envelopes with a slide rule. The result was worked out with the chemical engineer—a process that gave the chemist a good knowledge of engineering.

Mr. Kearton is head of the acetate division and processing division of Courtaulds and has been closely associated with the development of the company's acrylic fibre. He has been a director of Courtaulds for the past five years.

★ MR. ROBERT EDWARDS' suggestion that the battle of wages and prices should be taken out of industry by the creation of a national minimum wage (see page 753) is at first sight interesting. It should be considered carefully because any move aimed at easing labour-management tension is most welcome.

A similar scheme operates in Australia, where the national minimum is supplemented by 'margins' over and above the rate, negotiated separately for individual trades. There can, of course, be no guarantee that such a scheme would eliminate industrial strife; it certainly has not done so in Australia.

While the proposal has its merits, there can be no lasting peace in industry until it is realised that there is no longer any room for 'two sides' in industry and that both management and labour are working for the same ends; if they worked as a team both company profits and employee earnings would benefit.

★ FITTING END to Mr. John A. Oriel's presidency of the Institution of Chemical Engineers on Tuesday night was his announcement at the annual dinner that Prince Philip was to be the institution's first Royal Patron. It was only a few weeks ago that the institution was granted a Royal Charter by the Queen.

Alembic recalls that the Prince was chief guest at the annual dinner two years ago. His willingness to become its first Royal Patron shows the keen interest that he takes in the progress of the chemical industry in general, and chemical engineering in particular. This double honour in Mr. Oriel's last year as president is due in no small measure to the untiring efforts made over many years by Dr J. B. Brennan, general secretary, to keep the institution in the forefront as a professional society.

Alembic

Permanent Shortage of Physicists Says Professor Childs

Institute Conference at Glasgow

GROWING concern over the shortage of scientists in general and physicists in particular was referred to by Professor W. H. J. Childs, F.Inst.P., of Heriot-Watt College, Edinburgh recently. He was giving the opening address at a two-day conference on 'Training in physics,' arranged by the Institute of Physics at the Royal College of Science and Technology, Glasgow.

Professor Childs said that apprehension at this state of affairs was not lessened by knowledge of the efforts being made in training physicists in China and the USSR. Faculties of physics and applied mathematics were the most heavily populated in Moscow University, carrying some 2,600 and 2,000 students respectively. In the professor's opinion the shortage of physicists in this country and elsewhere was permanent and eventually scientifically trained workers would have to be rationed.

He suggested that the number of 'real' students (i.e., those genuinely interested in physics for its own sake) taking physics was unlikely to increase very much. He said that the increase of students since the war had consisted largely of another type. They were not so much physicists of necessity, as of choice, choosing physics from a number of possible careers because of 'glamour, or economics, or expediency.' In his estimation they lacked something for which for want of a better word he could only refer to as 'imagination,' 'the power which a scientist has of clothing in his mind, the abstractions of science with the flesh of a multitude of associated sensa.'

Increasing Pressure

It was realised that there was increasing pressure on the student. Since the turn of the century, quantum theory, wave mechanics, nuclear physics, physics of the solid state, had been added to a heavy course. The cure for this was not obvious, but he felt that the problem had to be faced, in the near future. He asked whether the solution lay in reduced content and slower pace for graduate courses, leaving the eliminated subjects to be expanded in postgraduate courses? Should the courses be divided to suit either technologists or academic physicists, or were there parts of physics which were once fashionable but could now be dropped at no great loss?

Finally, Professor Childs remarked that for some time to come, there would be the problem of the student ill prepared through no fault of his own. He thought that possibly the universities and colleges might assist with summer vacation introductory courses. He wondered whether the Leaving Certificate was all that could be desired and did bursary competition fulfil a purpose?

He hoped that some of the solutions might be found during the conference, in which case the conference would have been worth while.

'Graduate physicists in industry' was the title of an address given by Mr. M. Milbourn, Imperial Chemical Industries Ltd., metals division, at the conference. He said that in 1925, the part that physicists could play in industry was not then fully appreciated but over the intervening years the scope of their employment had increased very considerably. Future demands of industry for physicists, he said, were very likely to increase, particularly as some of the more startling industrial developments had a physical basis. He, therefore, wished to discuss the knowledge and mental qualities that industry looked for in the graduate physicists it recruits.

A Major Role

Mr. Milbourn pointed out that physicists clearly had a major role in the electronic instrument, electrical and similar industries. In other industries they provided ancillary service to the work of chemists, metallurgists or engineers. Industry was not seeking graduates with specialised training, but those who had a thorough grasp of fundamentals and logic of their subject which they could apply to a variety of problems. The physicist's particular merit lay in his combination of precise observation, design and use of instruments, the formation of results in mathematical terms and the alternation of hypothesis and experiment.

A physicist's work was unlikely to be of a fundamental nature. Sir John Cockcroft, he said, had stated that approximately 20 per cent of the work at Harwell was in basic science and the remainder applied science or development directed towards specific objectives. In industry, Mr. Milbourn said, fundamental work would certainly be no higher and might well be lower. Industrial investigations usually followed a logical experimental pattern, although there was room for the inventive approach. He stated that university courses were not designed to develop the inventive frame of mind as this fell outside their ambit.

How a physicist was employed was dealt with briefly by Mr. Milbourn. Generally, he said, he would be a member of a team. A group might be formed, for instance, of a metallurgist, an engineer and a physicist and given a problem to solve. Another type of organisation was that in which teams of analysts, crystallographers, corrosion chemists and metallographers were formed and while conducting their own researches, also co-operated actively with metallurgists in solving metallurgical problems. Each individual, therefore, had responsibilities not only up and down the organisational line but also horizontally to his opposite members in other sections. Other attributes which might be looked for included administrative ability and co-operativeness.

Qualities the student physicist might acquire at a university were dealt with briefly by Mr. Milbourn. Industry, he said, could make provision for training in specialised matters, but it could not provide intellectual ability which should be the outcome of a university course. Industry was looking for educated men, and not for trained men.

Referring to the tendency for undergraduates to believe that an industrial career was only second best to an academic career, Mr. Milbourn said that the intellectual challenge of industrial problems was at least as great as those found elsewhere and would increase as the years went by.

Reports written by young graduates, according to the lecturer, were frequently of a lamentably low standard, particularly with regard to inability to convey a logical exposition of initiation of the work, relationship to allied investigations and conclusions drawn from it. Clarity of thought and expression were lacking and it was obvious that study courses had not instilled logical thinking.

These matters, Mr. Milbourn said, applied to graduates in general. For advancement to posts of high responsibility, there was a constant demand for people combining good technical knowledge with intellectual ability and fully rounded personalities.

The papers will be fully presented in the official journal of the Institute of Physics.

Union Leader Suggests a National Minimum Wage

ESTABLISHMENT of a national wages pool, with a national minimum living wage for everybody as a first principle, is the suggestion advocated by Mr. Robert Edwards, MP, general secretary of the Chemical Workers' Union in the current issue of *The Chemical Worker*. This proposal is aimed at taking the battle of wages and prices out of industry.

The 'strained industrial relations in the chemical industry' and the recent strikes have arisen, he suggests, because the system of collective bargaining 'is not capable of solving the industrial and economic stresses of modern industry.' Problems of rising prices can, he says, hardly be solved by negotiation between separate trade unions and representatives of industry.

The answer, Mr. Edwards maintains, is to establish a national wages pool with a national minimum wage, guaranteed to every industrial worker. It should be closely linked to a new retail cost of living index and would rise and fall automatically with the cost of living without any delays.

The task of trade unions would then be to negotiate wages over and above that minimum living wage, commensurate with increased productivity, increased profits and greater skill and training, which were increasingly arising out of new methods of production and new forms of public service.

Radioisotope Techniques in Fertiliser Production

Results and Suggested Follow-ups

INVESTIGATION into the application of radioisotope techniques to fertiliser production was the subject of a paper by Mr. P. Craven read before the meeting of the Fertiliser Society on 2 May held in the Guildhall of St. George, King's Lynn, Norfolk. With the background of increasing application of radioactive materials to industrial problems, Mr. Craven decided to examine known techniques to determine their applicability to a fertiliser works at King's Lynn. Since the various operations required in fertiliser production embrace many chemical and physical industrial processes, it was thought that many of the problems associated with these processes might be more rapidly and simply solved using radioactive materials.

Attention was first paid to the two raw materials of the industry—rock phosphate and muriate of potash—since these were known to have small quantities of radioactivity associated with them. Secondly, artificially prepared radioisotopes were used in an attempt to determine some of the characteristics of a granulation plant and a wet process phosphoric acid plant.

Phosphoric Acid

Studies on the activities of phosphoric acid and gypsum indicated that it was not practically possible to differentiate between the activity contributed by the radioactive materials in the acid and those precipitated with the gypsum, and hence it was not possible to obtain a measure of the phosphorus content of the gypsum by this means. Also, as the activity of the acid was low, variation in this as a result of dilution was not great enough to be of any practical value for analytical purposes.

Estimation of potassium content of samples of muriate of potash based on radioactivity measurements were reviewed by Mr. Craven, as also the advantages of a radiometric method for potassium determination of fertiliser samples. After thorough examination, it was found that the method was doubtful, particularly having regard to the present availability of reliable flame photometers. However, with further development of concentrated fertilisers, the analyst will be required to determine higher potassium contents. It is then that the use of the flame photometer becomes more doubtful due to its limitations and the radiometric method more attractive.

In plant investigations use was made of artificially prepared radioisotopes on two plants (a granulation plant and a phosphoric acid plant) in an attempt to determine certain of the flow characteristics.

Investigation on the granulation plant was to determine retention times and velocity of feeds through the granulator and drier. A plant of conventional design was employed which produced compound fertilisers, based on ammonium sulphate, superphosphate and muriate of potash at a rate of approximately 20 tons/hour. Activated muriate of potash was used.

The results obtained of granulation times for total feed show that, although the largest fraction underwent granulation for 2.2 to 2.6 minutes, a large proportion was processed for longer periods, e.g., 16 per cent from 3.4 to 3.8 minutes, representing 50 per cent more granulation time.

It was also found possible to determine: total granulating and drying times to which feeds are subjected, the degree of mixing which occurs in the granulator and drier, total weight of material held in the granulator and drier, time taken for feeds to pass from the foot of the surge hopper through the plant, total weight of material held in the plant, and some indication as to the relative granulating propensities of the feeds and recycle material.

Four separate experiments were carried out on the phosphoric acid plant using ^{24}Na in the form of sodium carbonate. This was transferred to a polythene bucket, dissolved in hot water and a small amount of hydrochloric acid, and, with the recording apparatus already running, the activity was introduced into the system.

Conclusions drawn from the experiments were that the feeds from both tanks were, in general, homogeneous and not subject to severe by-passing of the feeds to the outlets. Variations were noticed, however, in the specific activity of tank No. 1. The cause of the variations is not known and it is considered doubtful by the investigator that they could be caused solely by the difference between paddles of, or feeds to, the two tanks. Should the variations represent changes in the composition of the slurry, however, they could be, the author considers, highly significant and are now being examined.

Method and technique, reports Mr. Craven, can, in the light of experience, be improved. ^{24}Na, for instance, is not considered wholly satisfactory as a tracer owing to its precipitation as silicofluoride. There was evidence, too, that the $^{24}Na/P_2O_5$ ration was not constant for all samples of slurry and acid, possibly due to partial precipitation of the tracer and its subsequent dissolution in the filter washes.

It is recorded that there are few other suitable isotopes. Arsenic-76 could possibly be used. The ideal isotope is phosphorus-32, the author opines, although this only emits beta radiations and has a half-life of 14.3 days.

A more satisfactory assessment of available results would also have been possible, Mr. Craven suggested, if more attention had been concentrated on the activity contained in the production acid, recycle and wash liquors. Nevertheless, the experiments have provided useful information concerning the work of the plant and confidence in applying radioisotope techniques.

Additional experiments which could be carried out with advantage on the granulation plant, according to Mr. Craven, are: a more thorough study of drier flow characteristics, determination of the relative velocities of particles of differing sizes, determination of the potassium content of individual granules, determination of the homogeneity of fertiliser after bagging and determining if granules tend to form more readily from recycle material or raw feed.

Promoting Exports of Nuclear Equipment

BRITISH manufacturers of nuclear equipment are taking the lead to promote exports of nuclear power stations, research reactors, nuclear ore processing plants and nucleonic and electronic equipment for atomic energy plants, hospitals, research laboratories and industrial plants. UK manufacturers of nuclear equipment have recently formed the Nuclear Energy Trades Associations' Conference.

This new organisation is promoting an export drive for British nuclear equipment and is currently exhibiting at the Hanover Trade Fair (28 April-7 May). An attractive brochure covering the achievements of the nuclear industry in the UK has been produced for overseas distribution. NETAC also provides a link between the different sections of the engineering industry concerned with nuclear equipment.

Membership of the organisation comprises: British Chemical Plant Manufacturers' Association, British Electrical and Allied Manufacturers' Association, British Engineers' Association, British Industrial Measuring and Control Apparatus Manufacturers' Association, Scientific Instrument Manufacturers' Association, Society of British Aircraft Constructors, and Water-Tube Boilermakers' Association.

It is stated that specialist British firms can supply nucleonic control and measuring equipment for industrial uses such as: detection of defects and flaws in welds and castings, corrosion by external examination, leakage, measurement of thickness and of liquid levels in enclosed vessels; measuring the viscosity of opaque liquids and density of liquids and slurries, study of effectiveness of liquid in gas filters.

The stand at the Hanover Fair covers an area of 4,000 sq. ft. and includes new models of the Dounreay and Calder Hall projects. The Harwell Atomic Energy Research Establishment has arranged an exhibit dealing with the uses of radioactive isotopes for industrial purposes.

The new organisation has its headquarters at 32 Victoria Street, London SW1.

AUTOMATION TECHNIQUES IN THE CHEMICAL INDUSTRY

By A. Linford, B.Sc., A.M.I.C.E., A.M.I.W.E.

IN THE YEARS immediately preceding the last war it was the rule rather than the exception for managements, and engineers as well, to regard measuring instruments and automatic controllers, to a certain extent at least, as an expensive luxury instead of a positive aid to production. It was the more progressive of the larger manufacturing concerns who were prepared to 'invest in the future' and devote both time and money to investigations into the possibilities, within their particular industry, of what is now referred to as automation.

Since these pre-war years the picture has undergone a radical change and few, if any, industrial executives and engineers would subscribe to the view that automation is but a passing phase. On the other hand it must be admitted that there are still companies—their number is rapidly diminishing—that are resistant to the idea of adopting metering and automatic control either because their particular processes are not amenable to other than manual control or because the cost of automation would defeat the object in view, i.e. increase in efficiency would have to be purchased at too high a price.

In the majority of instances, the first argument is fallacious, while the second is rather a matter of degree. It is an axiom that without measuring the values of the physical variable involved in carrying out a process, the degree of efficiency achieved is largely a matter of luck and/or the intuition which goes hand in hand with practical experience.

Increased Efficiency

On any plant, the first step in the direction of increased efficiency is to compare the actual output per unit input with the theoretical, the former value being ascertained by making the appropriate measurements, while the latter is deduced by calculation. An investigation of this description will most likely reveal unsuspected losses which can be eliminated, or at least reduced, without undue difficulty and these alone may show a handsome return on the money and time spent in conducting the investigation. Whether subsequently to adopt automatic control is a problem in economies.

There is no doubt that an automatic controller, by virtue of the fact that it has been designed to perform one function, and one function only, does not suffer from human 'weaknesses' such as boredom and inertia. Therefore, if properly applied, an automatic controller will regulate the value of a particular physical variable in a prescribed manner to within closer limits than possible by manual means—its attention will be riveted continuously on the job in hand.

Whether such a high order of control is justified depends entirely on the individual processes—the saving thereby achieved may not warrant the use of such equipment. On the other hand the cost of the equipment may be more than counterbalanced by the reduction in manual labour required; in the case of shift work especially, this may be the deciding factor.

An investment in automatic control, however, may show a handsome return simply because the result is a final product of a consistently higher quality. It may also be pointed out that closer control frequently enables a plant to be operated at higher levels of pressure, flow, temperature etc., thus resulting in a greater throughput. In fact, each case must be decided on its merits.

Adequate Maintenance

A point of particular importance should, however, be stressed as it is so frequently given insufficient consideration—this is the need for adequate instrument maintenance. Maintenance does, in fact, present a difficulty in small works where the capital expenditure which would be involved in alterations to existing plant to enable automation to be applied would be prohibitive, and relatively few measuring instruments and automatic controllers are, therefore, used.

In such circumstances, i.e. when an instrument maintenance department is not warranted, yet the equipment must receive skilled attention, the only solution is to delegate the responsibility for all equipment of this description to a suitable member of the staff, provide him with the necessary tools for the job and arrange for him to be trained at the work of the supplier of the equipment; all the leading instrument manufacturers conduct customers' training courses free of charge. Without such maintenance the capital invested in instrumentation is wasted.

The development of instrumentation can be followed—and an assessment of future trend can be made—by an inspection of many large chemical and similar works which have undergone expansion from time to time, calling for duplication of process equipment. In the older parts of the works, numbers of instruments will be seen scattered round the plant.

For process control, involving, for example, the regulation of flow, temperature, pressure and level etc., the measuring instruments were located adjacent to the actual points of control. This frequently called for protection of the instrument against atmospheric conditions, e.g. lagging of flow meters to protect them from freezing and mounting them in wooden huts to enable charts etc to be changed in bad weather. When used, automatic controllers were also mounted adjacent to the point of control.

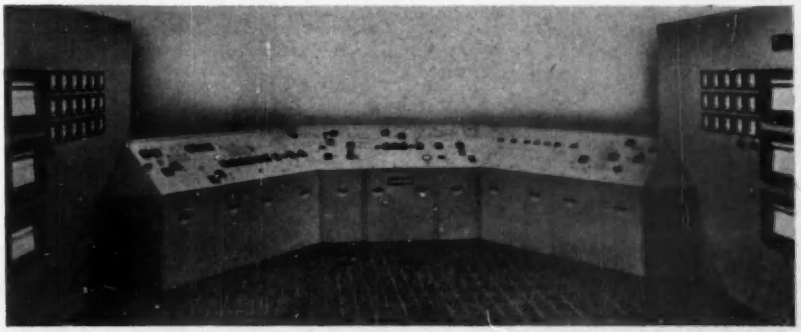
The logical development, of course, was to assemble all the instruments in batches at suitable central points. From such centralisation emerged the 'control room' where all the instruments are mounted on one panel. From here, the engineer in charge, for all practical purposes, can keep the operation of the whole plant under continuous observation without moving from his desk.

By the provision of remote control which can be operated from this point, the engineer is in a position to take the necessary corrective action immediately undesirable deviations occur, he can override the operation of automatic controllers in the case of emergency, and alter the plant throughput in accordance with operational requirements. In addition, the maintenance problem is greatly eased and the instruments have adequate protection from the adverse atmospheric conditions so frequently encountered in chemical plants.

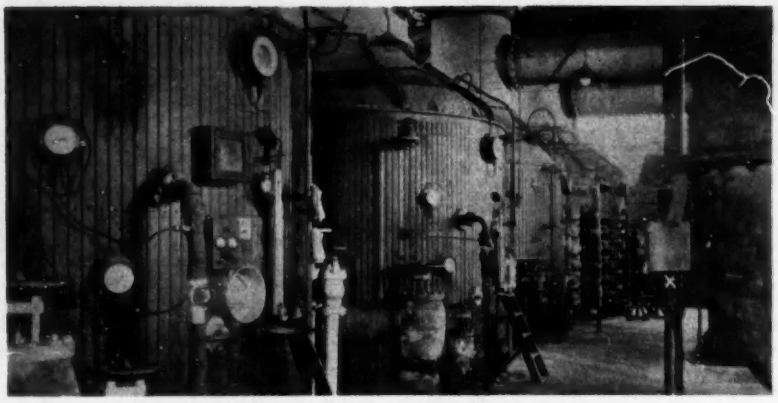
Complex Processes

In certain cases, e.g. where complex processes are involved, the instrument panel may carry a diagram of the plant in skeleton form, the measuring instruments and automatic controllers being mounted on the panel in their appropriate positions with respect to the diagram. The need for such diagrams is a controversial question and opinion is fairly evenly divided on this point. Supporters of the idea contend that it assists in the plant operation, especially in the case of emergency conditions. Opponents, on the other hand, maintain that the operating staff become so familiar with the plant that the diagram soon becomes useless to them.

No doubt there is much to be said for both sides, and whether such a diagram is warranted depends on individual circumstances. However, it cannot be denied that a diagram of this description is a valuable aid to training new personnel and makes a good impression on visitors—it may be that in some cases



A modern control desk with electronic control equipment



The old and the new. Above is a typical scatter of instruments on an old evaporator: Below, a modern graphic panel utilising miniature instruments

this latter consideration may be regarded as a 'sales point.'

Within the last few years there has been such an expansion in the replacement of labour by automatic equipment and the integration of separate process operations into one composite whole, i.e. the application of automation in the true sense of the word, that control rooms have been growing larger and larger in order to accommodate all the instrumentation.

Therefore, there is now a definite trend towards the use of miniature instruments, e.g. indicators with 2 in. or 3 in. diameter dials and recording instruments with charts having rectangular co-ordinates and an overall pen travel of 3 in. or so, instead of 8 in. or 10 in. diameter indicator dials and conventional circular charts with a 4 in. pen travel.

In this connection it will be appreciated that, for process control, consistency and reliability, rather than absolute accuracy, are the more important requirements. Significant reduction in panel surface is effected by using miniature instruments and control rooms can be reduced to manageable proportions even in the case of the most complex plants.

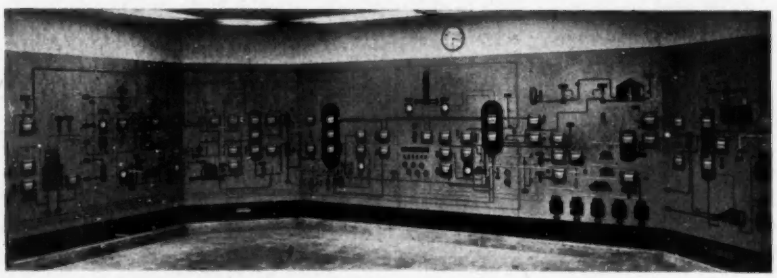
At the present time automation has reached such a pitch that little more can be done in the direction of labour saving and advances must be confined mainly to increasing throughput and improving quality of production.

The developments outlined in the foregoing have only been rendered possible by the close co-operation between the users and manufacturers of measuring instruments and automatic controllers. The general technique of instrument design has undergone important changes in the past few years. From the design of equipment to deal with specific measurements and automatic controls has emerged a very large measure of standardisation.

The principle now widely adopted is to mount a transducer of the appropriate form at the measuring point, the character of the output from the transducer always being the same irrespective of the nature of the physical variable being measured. These outputs are transmitted to receivers on the panel, all the receivers being identical in form. Controlling units may be incorporated in the receivers, the outputs of these in their turn, being transmitted to the regulating units. Pneumatic transmission is used for this purpose, all makes of equipment now being standardised to operate on a 3 to 15 p.s.i. air pressure range. That is to say, the minimum value of the variable being measured is represented by 3 p.s.i. and the maximum value, by 15 p.s.i.

Automatic controlling units form separate entities, which may be readily attached to the pneumatic receivers, and these also are pneumatic in operation, the overall range of air pressure output from each controller, applied to its respective servo motor of the regulating unit, again being 3 to 15 p.s.i.

The need of keeping in stock an adequate supply of all the spare instrument parts which might be required to deal with an unexpected breakdown is always a problem. This is specially so in the case of a completely automatic plant, where the failure of even one measuring instrument or automatic controller may seriously interfere with production. Standardisation on the lines indicated, therefore, is an important step forward in the direction of reducing to a minimum the spares to be carried and speeding up repair work. This work is now still further reduced by the expanding use of equipment design on a 'meccano' principle—a new element is 'plugged-in' in place of the one which has developed the fault.



In many instances, the absolute value of the variable being controlled is of no consequence from the operational point of view. When this is so the automatic control system can be simplified still further by applying the signal direct to the controlling unit in which it is automatically compared with a signal, the value of which is set manually or by another controller.

Any difference indicates a deviation of the actual value of the variable being controlled from the desired value, and the controller output, therefore, is adjusted in the direction to reduce this deviation. These operations, of course, take place continuously. This system of 'blind' control eliminates the conventional form of measuring instrument, only small diameter air pressure gauges being required.

Transmission is not limited to the pneumatic form since the value of many variables can be more conveniently expressed in terms of electrical quantities. A notable example of this is temperature measurement—both a resistance thermometer and a thermocouple can be connected directly to an electrical instrument which translates the electrical output from the detecting element into terms of temperature.

Electronics Applied

Within recent years the principles of electronics have been applied to automatic control techniques and a number of electronic automatic controllers have appeared on the market. It may be predicted with confidence that, in time to come, the principle adopted will be to utilise transducers which will convert the values of the measured variables into electrical quantities, all of which will, most probably, be transmitted to an electronic 'scanner' which will register all the values on one sheet of paper.

These techniques are in an advanced form of development—it is already possible to express a rate of flow in terms of an electrical quantity without any 'mechanical' equipment, pressure may be expressed in similar terms by using a strain-gauge type of transducer, and so on.

The advantages of electronic equipment lies in the fact that signals can be transmitted instantaneously over long distances through electric cables at a very low power level, and can be amplified to any desired degree at the receiving end. This means that there are no limitations to the relative positions of points of measurement, receivers, automatic controlling units and regulating units. Control rooms will be reduced in size and spares will consist mainly of standard 'plug-in' units.

However, a serious problem associated with these advanced forms of automation is the shortage of technicians possessing sufficient skill to anticipate and trace faults and generally maintain the equipment in first class working order. At the present time there is every indication that the position is not improving and the rapid expansion of automation will widen the gap between the demand and supply of this grade of personnel.

PREVIEW OF IEA EXHIBITION

Instruments and Automatic Equipment for Chemical Processing and the Laboratory

MORE than 200 exhibitors are taking part in the Instruments, Electronics and Automation Exhibition which is being held in the Grand Hall, Olympia, London, from 7-17 May. There will be much to interest both the chemical engineer and laboratory worker.

A wide range of automotive equipment is to be featured, and much of it is applicable in the chemical processing field. Automatic laboratory equipment will be prominent and two firms will show greater perfection in laboratory balances.

The exhibition is promoted by five trade associations: British Electrical and Allied Manufacturers' Association; British Industrial Measuring and Control Apparatus Manufacturers' Association; British Lampblow Scientific Glassware Manufacturers' Association; Drawing Office Material Manufacturers' and Dealers' Association; and Scientific Instrument Manufacturers' Association.

Each day during the exhibition lectures and discussions will be held at Olympia. Admission tickets will be obtainable from the Information Bureau at the entrance. Sessions will cover nuclear power, instrumentation in industry, computer controlled machines, automatic gauging, reactor instrumentation, nucleonics and isotopes in industry, electronic production control, training the electronic technologist, and training for research.

In the following preview of exhibits of interest to the chemical industry, stand numbers are printed in bold type.

Portable Air and Gas Flow Testing Sets

Complete portable air and gas flow testing sets, pitot tubes, yaw tubes, dust sampling, inexpensive wall mounting manometers for filter pass indication and orifice plates will be exhibited by Airflow Developments Ltd., 121 New Road. Booker, High Wycombe. In addition two new portable testing sets, marks 4 and 5, will be featured.

The mark 4 set is a fitted with folding legs and has two adjustable gauges, ranges 0-.5 in. w.g., 0-1 in. w.g., 0-2 in. w.g., 0-10 in. w.g. in scale length of 12.6 in. and 0-2 in. w.g. 0-4 in. w.g. 0-10 in. w.g. and 0-20 in. w.g. in scale length of 25.3 in. Gauges may be connected in series to read up to 30 in. w.g. Accessories include a 31¼ in. stainless steel pitot tube, two 30 ft. lengths of p.v.c. tubing, tee piece, barometer, and spare fluid.

The mark 5 set is a new lightweight model designed to supersede the former mark 3 model **(924).**

HF Titration Techniques

In the past 12 months, Advance Components Ltd., Roebuck Road, Hainault. Ilford, have developed an application for their 'Q' meters, types T1 and T2, in the new HF titration techniques now being used by several companies in the chemical industry. The particular advantage of using HF conductive elements, is elimination of undesirable electrode potentials and electrolytic action.

The titration cell may consist of a coil of wire about 10 gauge. This is wound round a glass tube containing the sample, the number of turns and diameter depending on the frequency. For example, a coil of five turns 1 in. in diameter may be made to resonate in the 10 to 30 Mc./s region. A 'Q' metric end point titration using an inductive cell depends mainly on the damping effect of the sample in the coil which is acting both as a changing dielectric and conductance

The Advance 'T' Q meter is claimed to be ideal for this form of HF titration since it incorporates a means of measuring small percentage changes of Q in a fundamentally accurate manner. The company hope to have detailed information on the construction of cells and the basic uses of the instrument in HF titration. **(934).**

Analmatic Instruments

Baird and Tatlock (London) Ltd., Freshwater Road, Chadwell Heath, Essex, will exhibit recently redesigned instruments. Of particular interest are the latest developments in BTL Analmatic automatic instruments and laboratories. In addition, many standard BTL products such as the Van Slyke apparatus, stills, stirrers etc., will also be shown.

Among the more important exhibits are: Analmatic uranium analyser, mark II, for monitoring the concentration of uranium in liquors from a maximum of 16 different sources; Analmatic analyser (grouped individual samples); Analmatic auto titrator; Analmatic Karl Fischer apparatus for the determination of moisture; continuous flow absorptiometer; liquid flow monitor; valve switching mechanism for gas samoling; titration absorptiometer; electrolytic analysis apparatus with rotating electrodes **(515).**

Nucleonic Level Indicator

A nucleonic level indicator on the stand of Baldwin Instrument Co. Ltd., Dartford, Kent, will demonstrate one of the newest uses of radioactive isotopes, i.e., for the measurement and control of the level of either solids or liquids in any type of container.

The principle of operation is simple. An isotope is fixed one side of a tank and a detector at the other, such that the radiation from the isotope is directed at the detector. When the level of the material inside the tank is below the radiation beam, the intensity of radiation at the detector is high. When the material comes between the isotope and the detector, the radiation intensity reaching the detector is reduced. The detector is so designed that it can discriminate between the two intensities of radiation, operating suitable relays which in turn can operate either indication/alarm or automatic control systems.

Also to be shown are electro-magnetic pilot valves, designed to meet the requirements of modern process control systems where it is essential for equipment to give unremitting service at maximum efficiency, often under arduous conditions. Five models are available having bore sizes up to 3/16th diameter and having maximum working pressures from 15 to 250 lb. per sq. in.

Two instruments have been added to the Baldwin range of densitometers, The comparator densitometer measures variation in colour and density of liquids, both static and in continuous motion. The new version of the line densitometer measures colour as well as density to a high degree of accuracy **(933).**

Photo-Electric Refractometer

A comprehensive range of Bellingham and Stanley Ltd. (71 Hornsey Rise, London N19), optical instruments will be shown including the photo-electric refractometer R. 300, the production model, the photo-electric continuous flow indicating and recording refractometer. Examples from the company's range of pan and pipeline refractometers will include models for fitting directly into evaporating pans or pipelines. Readings are continuously available and no sampling is necessary.

The new photo-electric polarimeter is said to eliminate eyestrain, allowing greater accuracy of reading **(948).**

Protective Glass for Nuclear Research

Heavy lead glass shielding blocks and protective glass in polished plate form, which are proving increasingly useful in nuclear research will be exhibited on the Chance-Pilkington Optical Works stand.

Windows up to 18 in. square of requisite thickness are made from lead glass of density 4.3 grammes per cubic centimetre, with glass of density 6.1 in blocks of smaller area. For larger windows up to a maximum area of 10 square feet, polished plate glass one inch thick, with densities 2.5 or 4.3, is used. The choice of density depends on the material used for the opaque biological shield in which the windows will be located.

Control of the darkening effect or discolouration caused by high-energy radiation is achieved by adjustment of the chemical composition of the glass. **(610).**

Automatic Particle Counter

Most important exhibit of Casella (Electronics) Ltd., 46 Onsaburgh Street, London NW1, will be their automatic particle counter and sizer, which uses the method of wide tract scanning. The

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particle produces a voltage pulse whose amplitude is proportional to the amount entering the scanning slit. The instrument is set up according to the optical characteristics of the material to be analysed.

The reciprocating stage on which the specimen is mounted allows the scanning slit to be located on the optical axis of the microscope. At this point the image is free of distortion, due to curvature, which occurs off the optical axis in high resolution objectives.

The filament lamp type of illumination gives a high light intensity (when using Kohler's system of illumination), which is such that good signal to noise relationship is obtained for slit sizes below a micron in width.

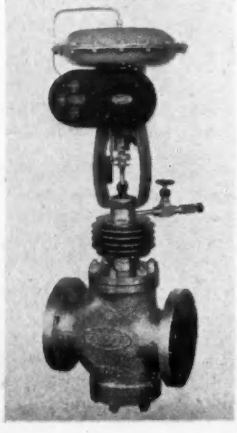
The instrument, which is housed in a console unit for ease of operation, can be used to size and count a wide range of materials on either a standard 3 × 1 in. slide or in a liquid counting chamber. Light or dark background can be used. It is stated that chemical powders are readily counted and sized. **(412).**

Thermometers

Coley Thermometers Ltd, 2 London Road, Brentford, Middlesex, will show a range of dial distance-reading thermometers, electric contact thermometers, temperature controllers and chart temperature recorders in vapour pressure and mercury-in-steel actuations. Also to be seen will be a range of pyrometers, thermocouples and multi-point switchboards, pyrometer indicators fitted with electric contacts and pyrometer controllers. **(905).**

Diaphragm Control Valves

The Crosby Valve and Engineering Co, Ltd, Wembley, Middlesex, will feature several different types of Mason Neilan diaphragm control valves. The first is a 14 in. line size valve, which stands some 7 ft. high and weighs approximately 1½ tons. This is a double-seat V-port equal percentage characteristic valve, which is capable of handling a flow of approximately 6,000,000 lb./hr. of water at a pressure drop of 30 p.s.i.g. There will also be three fully-sectioned diaphragm control valves, showing complete details of construction. One of these, an angle valve, will be working from a pressure controller.



Mason Neilan diaphragm control valve by Crosby

These control valves have pressed steel diaphragm case, moulded reinforced diaphragms, and the superstructure yoke is secured to the bonnet by means of a drive nut facilitating dissembly. Instead of relying upon screw threads to locate the seat rings, they are spigoted into the valve body, thus ensuring absolute concentricity.

Another eye-catching exhibit will be a working demonstration of a duplex model 12800 series air operated displacement type level controller. This instrument will be automatically controlling the level of water in a glass tank, by controlling the rate of discharge from a pump through a control valve. At the same time, it will be transmitting the actual water level to a remote receiving gauge calibrated in inches water level. **(912).**

DSIR Exhibits

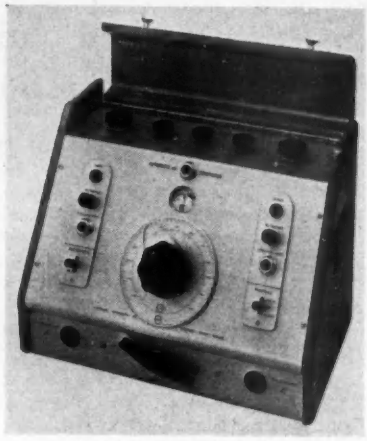
The Department of Scientific and Industrial Research, 5-11 Regent Street, London W1, has organised a display of new instruments of a very diverse character. Many DSIR research stations and allied research associations have contributed and 25 different instruments will be shown.

These include: A micro-electro-magnetic vacuum balance, by the British Coke Research Association, an instrument for measuring tension on running yarn and a single probe for measuring moisture in jute packages by the British Jute Trade Research Association, microscope projection unit, stiffness tester, and crease recovery tester by Shirley Developments Ltd., an ionisation chamber for the secondary standardisation of radioactive material, by the National Physical Laboratory, pressure transducer, lustre meter, electronic tension meter, and strainometer, by the British Rayon Research Association.

Polarographic dissolved oxygen recorder by the Water Pollution Laboratory, air-content of hydraulics oils, by the Mechanical Engineering Research Laboratory, dynamometer for textile testing with extensometer, by the Research Association of British Rubber Manufacturers, drying control instrument, by the British Leather Manufacturers' Research Association. **(502).**

Automatic Titrimeter

The EIL laboratory automatic titrimeter, by Electronic Instruments Ltd., Lower Mortlake Road, Richmond, is to be shown with new accessories that enable acid-base, Karl Fischer and dead stop end point titrations to be performed automatically. There is also a new coulometric titration unit which is claimed to open up new fields in micro-analytical work. This advanced instrument enables the chemist to dispense with the use of standard reagents as the whole titration is performed by the internal generation of ions within the solution being analysed.



EIL 24 automatic titrimeter

A comprehensive display of industrial pH equipment, electrodes and accessories, will include a working model of the EIL industrial pH meter, recording the readings of six independent electrode systems, through an automatic switching unit which selects each electrode in turn. The output of the meter is taken to an electro-pneumatic converter which enables conventional pneumatic recorders and controllers to be used to provide a complete system of automatic process control. **(930).**

Fluid Density Gamma Gauge

Equipment to be shown by Ekco Electronics Ltd., Southend-on-Sea, will include Ekco nucleonic and electronic equipment. A working display of the new Ekco type N611 fluid density gamma gauge will show how the contents of a liquid container such as a pipeline can be determined without access to the fluid or disturbance of the pipeline. A gamma ray source is situated on one side of the pipeline and a pressurised ionisation chamber on the other, a type N565 indicator unit measuring output from the measuring head. **(505).**

Automatic Control and Recording Equipment

Shown for the first time by EMI-Electronics Ltd., Hayes, Mddx, is the new automatic control and recording equipment that is applicable to a wide variety of processes and operations. One example to be featured is a working demonstration showing the application of these techniques to an automatic weighing system developed in co-operation with Western Manufacturing (Reading) Ltd.

The exhibit comprises a conveyor, a hopper and feed system for dry materials and a 20 lb. scale fitted with a graduated disc and photocells. These operate by means of a digital transducer and control automatically the filling of the containers so that the exact pre-determined weight of material is filled into each one.

The equipment is arranged to allow

for two different feed rates, so that the initial filling is done quickly and the final stage slowly. The system is a general one for controlling or recording the position of a shaft. It does not need an optical digital transducer, nor is it restricted to weighing operations.

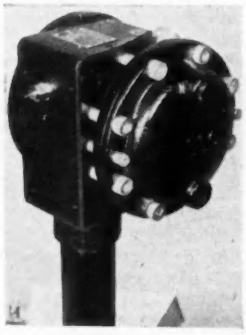
Also to be shown are two models from the EMI range of dynamic balancing machines, which provide under production conditions a means of rapid and quantitative location of unbalance in rotating parts. **(404).**

Laboratory Glassware

A special feature on the stand of H. J. Elliott Ltd., E-Mil Works, Treforest Industrial Estate, Glam., will be E-Mil/Vogel range of small scale glass apparatus. This has been designed in conjunction with Dr. Arthur I. Vogel and has been the subject of Part 1 of his recent book 'Elementary Practical Organic Chemistry.' Also to be shown is the company's standard range of volumetric laboratory glassware, thermometers, hydrometers and viscometers. **(414).**

Nuclear Instrumentation

Elliott Brothers (London) Ltd., Borehamwood, Herts, will show their largest ever display of equipment. Centred round a main theme of integrated system design for large industrial processes, the display will include the full instrumentation for a nuclear power station, a typical graphic panel for an oil refinery platforming unit, instrumentation for the rubber and plastics industries, and one of the latest models of the Elliott general purpose analogue computer G-PAC. A separate section of the stand will be devoted to products of the Fisher Governor Company, a fully-owned subsidiary of Elliott Brothers.



'Dry type' bellows operated flow meter model 700 made by Elliott Bros. under US licence

A 'mock-up' control room of a nuclear power station will contain the full instrument range necessary, mounted into large graphic panels which will indicate diagrammatically the function of each instrument. To simulate the operation of the nuclear reactor itself, an Elliott type ND181 reactor simulator will be coupled into the system and will provide an opportunity for visitors to experience the 'feel' of controlling the plant.

Another graphic panel will be used to display a selection from the range of Bristol's Metagraphic miniature pneumatically-operated instruments. The panel will represent a typical refinery platforming unit, the instruments being used to record and control such variables as flow, pressure, level and temperature.

A display panel devoted to instrumentation for processes in the rubber and plastics industries will emphasise the importance of the two most critical variables, temperature and time, involved in such operations. Examples of Bristol's instruments for measurement, recording and control of temperature, and for controlling the times of processes, will be exhibited, and in addition there will be particular stress on the many applications of instruments from the company's standard ranges to the most advanced manufacturing processes and techniques.

Among exhibits of the Fisher Governor Co. will be the Fisher type 403 blending unit for automatically controlling blending processes common to the chemical and petroleum industries, the type 779K pilot for use with ball-float level controllers and using either water or compressed air as the operating fluid, and examples of recently produced special-purpose control valves. **(411).**

Test Sieves

Endecotts (Filters) Ltd., 251 Kingston Road, London SW19, are to show test sieves to BS and US standards, manufactured from stainless steel for manufacturers and users of chemicals and reagents which attack and corrode standard sieves. In addition, polythene and nylon coated sieves fitted with nylon and silk weaving will be displayed.

Also on show will be test sieves to BS 410/43, made under licence from the British Standards Institution, US sieve series (ASTM E11/39), and a number of other international standards. Pocket interchanger sieves, collapsible monitor sieves and sieves specified by the Institute of Petroleum and British Pharmacœpia are to be displayed.

The rapid separation of particles will be demonstrated with transparent rimmed test sieves on an Endrock vibrator. Visitors will see a mixture of coloured materials inserted in the top of a nest of sieves; in approximately 30 seconds it is graded into six different sizes, each of which is a distinctive colour. **(950).**

Temperature Controller

The Transitrol indicating temperature controller, type 990, by Ether Ltd., 60 Tyburn Road, Birmingham 24, is a new self-contained direct-deflection instrument for indicating and controlling temperature to close accuracy over a wide range. It can also be applied to any process where the signal can be converted into a direct current or voltage. The Transitrol operates on a new principle which utilises a transistor and, in consequence, the need for thermionic valves, magnetic amplifiers and oscillator circuits has been eliminated. It embodies few moving parts and does not include the usual types of electronic component that fail after prolonged use.

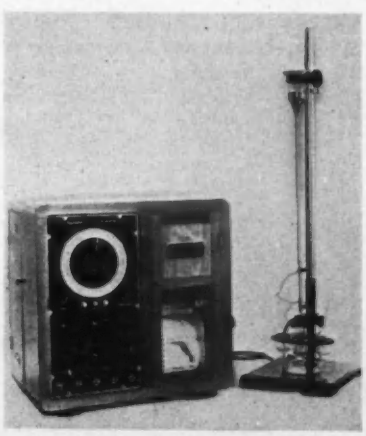
Ether Ltd.'s 7 in. edgewise temperature indicator

It incorporates a conventional galvanometer used as the measuring system, and an indicating pointer. The latter operates a simple photo-electric system which, in turn, controls the heating medium. The instrument is designed as a plug-in unit and is easily withdrawn from its casing. It is suitable for wall or panel mounting.

The new Ether 7 in. edgewise temperature indicator (illustrated) has a Bakelite moulded front and a totally enclosed terminal housing of the sides. Removal of the four fixing screws on the front enables the instrument and chassis to be withdrawn. **(904).**

Tinsley Polarograph for Chemical Analysis

Eversheds and Vignoles Ltd., Acton Lane Works, London W4, will show a comprehensive range of equipment for all industries. Included is the new Tinsley polarograph, mark 17, developed for laboratories and other establishments where rapid and accurate chemical analysis is called for. This is a recording instrument with a range of sensitivities from 0.1 microamps to 150 microamps in 34 steps. A derivative circuit is incorporated and there are two time constants for polarograms: (a) where sensitivity of trace analysis is essential and (b) where high resolution is of prime importance. Four stages of electrical damping are



New Tinsley Polarograph, mark 17

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available and the damping switch allows fine control for different dropping rates of the capillary.

The new mark 16 polarograph is a smaller instrument designed for instructional purposes and for laboratories where the volume and scope of the analytical work does not call for the larger model. **(405).**

EEL Instruments

Evans Electroselenium Ltd., Harlow, Essex, will be exhibiting a complete range of EEL photo-electric instruments, including the EEL photo-extinction sedimentometer for the determination of size characteristics of fine powders; the EEL powder reflectometer for the determination of the specific surface of fine powder by the 'tinting strength' method; EEL microammeters and galvanometers; portable colorimeter, flame photometer, absorptiometer, electrophoresis apparatus, reflectance spectrophotometer etc. **(200).**

Gamma Ionisation Chambers

The gamma ionisation chambers, type NE/006 to be shown by General Radiological Ltd., 15-18 Clipstone Street, London W1, are fully sealed and can be fixed to a mounting plate or other equipment. Except for the fixing bolts and the aluminium/steel vacuum-tight bonded inserts used with the glass lead-through insulators, all metal work is of aluminium.

Also to be shown is a dosimeter charging unit, type RD 291, a pocket size instrument designed to charge pocket quartz fibre dosimeters of all British and US types. It is a fully sealed battery operated unit incorporating an internal light source, which facilitates reading, without affecting the charge on the dosimeter, provides charging and discharging. **(703).**

Magnetic Flow Meter for Corrosive Acids

Among exhibits of Foxboro-Yoxall Ltd., Lombard Road, Merton, London, SW19, is a new magnetic flow meter developed to meet the need for a fluid flow meter that will measure the volume rate of all fluids with an electrical conductivity. It is particularly suitable for corrosive acids, rayon viscose, sewage, rock and acid slurries, sand and water slurries, paper pulp stock, rosin size, detergents and food products.

There is no restriction of flow line, no loss of head and no pressure taps to become blocked. The meter comprises the transmitter and a Dynalog flow receiver which may be an indicator, a recorder or a multi-record Dynalog. It has a rangeability of 100 to 1. The transmitter (illustrated) consists of a stainless steel tube, an electrical insulating liner, an electro-magnet, which induces a magnetic field across the tube, and two metallic electrodes which are essentially flush with the inside surface of the tube.

Line sizes vary from 2 in. to 8 in. (other sizes by request) suitable for flow rates from 0-2,500 g.p.m. to 0-40,000 g.p.m. **(409).**

Portable CO_2 Tester

The stand of James Gordon and Co. Ltd., Dalston Gardens, Stanmore, Middlesex, will form part of a joint exhibit by various members of the Associated Automation group. Among exhibits will be the latest Gordon SD control, a simplified form of automatic control for small and medium oil fired boilers and the Mono portable CO_2 tester, recently placed in production by Gordon, which is of interest to those who have to take CO_2 readings by means of an instrument which is light and transportable. It is built in a light steel case with removable front.

On the left of the case is a 4 in. diameter dial indicator graduated clearly in percentage CO_2. On the right is an absorption bottle containing a solution of caustic potash on top of which is a small quantity of oil. There are no rubber diaphragms or other parts which could become worn, allowing the caustic potash to leak.

Other exhibits include automatic controls for boilers, steam pressure reduction and desuperheating control valves, Igema distance boiler water level indicators, and Gordon pneumatic power operators for control valves, stop valves and other purposes. **(510).**

Metal Laboratory Furniture

Established manufacturers of laboratory furniture in wood, Griffin and George Ltd., Ealing Road, Alperton, Wembley, will demonstrate in association with Grundy Equipment Ltd., the flexibility of a new range of metal unit furniture. An equivalent range of unit furniture in wood will also be on view.

Other exhibits will include mark 2 gas liquid chromatographic apparatus, Autopoise centrifuge, a new range of water baths, Griffin skeletal atomic models, constant rate gas sampler, balances, flask and bottle shakers, stirrers, Griffin-Sutton bomb calorimeter. **(413).**

Electronic Potentiometer

Exhibits of Integra, Leeds and Northrup Ltd., 183 Broad Street, Birmingham 15, include 12 specimen models of the new type H Speedomax,

The new type H speedomax

covering electronically operated potentiometric indicators, round chart recorders, strip chart recorders and controllers. This new model is claimed in several respects to be unique. It is compact and range changing is quick and easy. It is claimed to be lower in cost than any comparable electronic potentiometer. **(301).**

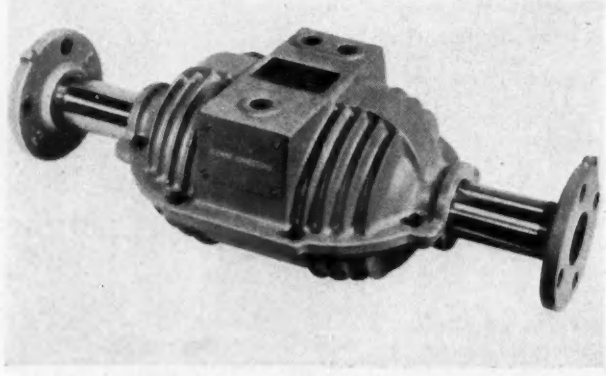
Photoelectric Polarimeter

In a new form of the microptic polarimeter, to be shown by Hilger and Watts Ltd., 98 St. Pancras Way, London NW, the match point is determined photoelectrically and is shown by the nullpoint reading of a meter. A digitiser calibrated and encoded in sugar degrees is geared to the circle. Readings are taken from large illuminated figures displayed remote from the instrument and recorded semi-automatically on punched cards for later analysis. **(402).**

Tel-O-Set Instruments

Special emphasis is to be given by Honeywell-Brown Ltd., 1 Wadsworth Road, Perivale, Middlesex, to Tel-O-Set miniature instruments and their application. This range offers a standard pneumatic indicator, recorder and quick-connect controller for the measurement and control of all process variables. The reduction of instrumentation to standard units simplifies selection, installation and operation.

A display of pneumatic transmitters, will include differential converter flow meters (high and low range), a differential converter liquid level controller, a pressure transmitter and an ElectroniK



New Foxboro magnetic flow meter

electro-pneumatic temperature transmitter.

Other exhibits include ElectroniK continuous-balance instruments which permit temperature, pressure, flow, or any other variable to be transduced to electrical terms and then measured, recorded and controlled. **(410).**

Electronic Controllers for Dye Vats

A new range of electronic controllers for the control of temperature in furnaces, dye vats, heat exchangers and many other industrial processes is to be featured by Kelvin and Hughes (Industrial) Ltd., 2 Caxton Street, London SW1. Employing a sensitive moving coil microammeter in the measuring section, and an 'indefinite life' photo-transistor in the control section, these instruments can be applied to any process where the variable to be measured and controlled can be converted into millivolt output.

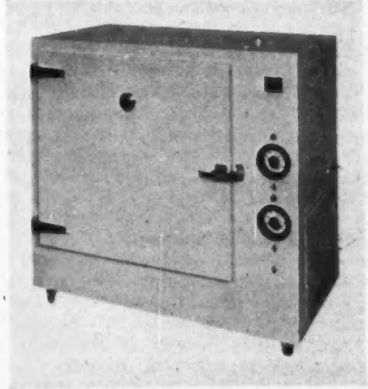
A new system of automatic ultrasonic testing will be continuously demonstrated. **(310).**

Weyco Climatic Cabinet

The Weyco climatic cabinet to be featured by Laboratory Equipment (London) Ltd., the laboratory sales division of Weyco (Equipment) Ltd., 18-20 Dames Road, London E7, incorporates new principles that make it more accurate. It is claimed to operate at any temperature and to cycle between day and night temperatures and humidities, a feature that can be arranged for automatic operation.

A positive air circulation is so controlled that it remains unaffected by shelf or cabinet loading. Air conditioning takes place in a treatment chamber that surrounds the working chamber and it is here that the air is conditioned as required by the addition of moisture and/or heat. A continuous circulation of conditioned air passes through the chamber. Humidity is created by the injection of atomised water into the treatment chamber where it is mixed with the temperature controlled air and becomes conditioned. High humidities at low temperature are possible without affecting working temperature.

The controls comprise two dial contact thermometers (wet and dry bulb) a heater switch, a humidity switch and an air circulating fan switch.



Weyco climatic cabinet

Also to be shown are the Weyco airflow laboratory oven, Weyco heavy duty stirrer and a range of laboratory apparatus. **(949).**

Electronic Temperature Recorder

Newly introduced Commander KE self-balancing electronic temperature recorder is to be shown by George Kent Ltd., Luton, Bedfordshire, working as a recorder, measuring the temperature of six different salts and metals heated by gas burners. Thermocouples inserted into the various salts and metals will be switched in rotation to the instrument at 30-second intervals to show the speed of response and the stability of the KE.

Flow-ratio control will be demonstrated, using water flow lines, by means of two more models in the Commander range.

The field of high-temperature *p*H measurement is represented by a tank-type primary element and Multelec *p*H recorder. The primary element, being corrosion-proof and submersible, is easily sited where necessary and needs no float where liquid level varies. **(403).**

Counting Techniques as an Aid to Automation

Theme of the exhibit of Labgear (Cambridge) Ltd., Willow Place, Cambridge, will be on the use of counting techniques as an aid to automation. The two fundamental instruments used in the demonstrations will be the new recording ratemeter, D.4124 and printing counter, D.4123, both of which provide records of repetitive processes in traditional form.

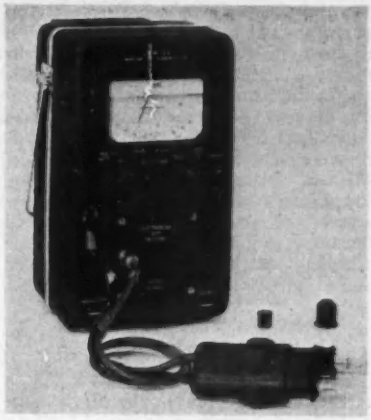
An improved version of the automatic paper chromatogram scanning equipment will be demonstrated assaying radioactive paper chromatograms. A new directional scintillation counter, D.4132, will be shown with three interchangeable collimators giving end-window, wide-angle and point source geometry.

An automatic scheme for X-ray diffraction counting will also be shown, permitting simultaneous counting on both the fixed and rotating detectors during the same period of time. Thus a unit count can be selected for either channel enabling a direct reading ratio to appear in the other channel. **(501).**

pH and Moisture Meters

Marconi Instruments Ltd., St. Albans, Hertfordshire, will show instruments for *p*H and moisture measurement.

The portable *p*H meter, TF 889/1, is a general purpose instrument which is light and robust, but is stated to be capable of reliable and accurate measurement even in the hands of an unskilled operator. It is battery operated and reads directly over the useful range 1 to 11 *p*H with a discrimination of 0.05 *p*H. Controls are provided for adjusting temperature compensation, periodically checking



Marconi portable pH meter (TF 889/1)

scale accuracy and resetting battery conditions, but only one control is used during the actual measuring process. A 'press to read' switch is located in the middle of the electrometer unit which, when pressed, connects the electrode to the electrometer, and when released disconnects the electrodes between measurements so that the random scale readings are eliminated. When a continuous indication is required—i.e. for neutralising, for finding the end point in a titration, or for monitoring a fermentation process— the switch can be locked down by a press-and twist motion.

Moisture meter TF 933A is also a portable instrument for rapid and accurate measurement of the moisture content of a wide range of materials, particularly those of organic origin. The instrument is said to be easy to use and spot checks can be made by operatives with no knowledge of electronics. The standard model takes its supply from long-life internal dry batteries, but these may be replaced by an a.c. power pack which is available as an optional accessory. Measurement is made between the two concentric annular metal electrodes which form the base of the test cell. Range of measurement extends from somewhat below the air-dry value to the near saturation point. **(504).**

Vapour Phase Chromatograph

Metropolitan-Vickers Electrical Co. Ltd., Manchester 17, will show a vapour phase chromatograph designed for the analysis of gases and liquids. Based on well-known principles of gas-liquid partition chromatography, it is fitted with three columns and is equally suitable for routine analytical applications or for research work. The instrument can be arranged for either manual or automatic admission of gas and liquid samples.

A katharometer, comprising two thermal conductivity cells placed in the inlet and outlet lines of the column, is used as a detector. The individual components of the sample appear as distinct peaks in the trace. Temperature stabilisation of both column and katharometer is provided at any value up to 300°C.

The MS6L mass spectrometer, a portable equipment, uses the ability of

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the mass spectrometer to detect extremely small concentrations of one gas in another; in addition to high sensitivity it gives a direct measure of concentration and is therefore positive in indication. It can be used for the testing of pressurised or evacuated systems; it will test for the presence or absence of leaks, measure the rate of leakage, and if necessary find the exact location of a leak. Pressure vessels and systems are tested by placing the tracer gas inside under pressure, and sampling the atmosphere around suspected parts. **(401).**

Nuclear Fire Alarm for Chemical Plants

Of special interest to engineers concerned with fire prevention in chemical plant and equipment will be the Minerva detector produced by the Minerva Detector Co. Ltd., Lower Mortlake Road, Richmond, Surrey. This is a new nuclear alarm which sounds off at the first sign of smoke from smouldering material, long before any appreciable heat is generated or any flame breaks out. The sensitive element is a small ionisation chamber, the electrical characteristics of which are radically changed when the first trace of products of combustion reaches it, causing alarm bells to ring and appropriate warning signals to be transmitted to remote fire stations or watch offices.

The speedy detection while a fire incident is still in its earliest stages will be illustrated on the stand by a full size rack of air-cooled electronic equipment, the air output from which is continuously monitored by a Minerva detector. **(930).**

Ministry of Supply Exhibits

Some aspects of the day-to-day work of the Ministry of Supply research and development establishments on instruments, electronics and automation will be illustrated. In the field of vibration stress on human beings a section of the stand will be devoted to a demonstration of hand and seat movements at various frequencies up to 40 c.p.s. **(909).**

Carbon Products

Among the Morganite carbon products to be shown by the Morgan Crucible Co. Ltd., Battersea Church Road, London SW11, will be bearings, sealing rings, thrust washers, moulds, boats, valve anodes, pile resistances and granules. The properties of Morganite carbon include self lubrication; wide range of resistance to chemical attack; low thermal expansion; good mechanical strength at elevated temperatures; high resistance to thermal shock; good thermal conductivity; non-wetting by molten metals, slags or glass; and good electrical conductivity. **(927).**

Film Scanning Particle Analyser

A comprehensive display of specialised electronic instruments and equipment, and representative selections of valves, tubes and semi-conductors for industry and communications will be shown by Mullard Ltd., Century House, Shaftesbury Avenue, London WC2.

Now in full production is a film scanning particle analyser type L.188. This version has several important advantages over the prototype, resulting in increased accuracy of counting and higher discrimination. A range of fixed, pre-set and variable ultrasonic delay lines using mercury as the delaying medium will be on display. Of these, Type YL2100 is a complete laboratory instrument incorporating Velodyne control, and input and output amplifiers. **(305).**

Sequential Precision Process Timer

To provide a means of automatically and precisely time-controlling a series of operations from a compact, accurate and reliable unit capable of adaptation to the widest possible conditions of industrial and scientific process control, a sequential precision process timer, Model 2025, has been developed by Nagard Ltd., 18 Avenue Road, Belmont, Surrey.

Basically, a master unit provides power supply and an electronic trigger control device which can be connected to any number of time interval controlling stages. These control units will then operate for pre-set time intervals in automatic sequence, or can be stopped at any desired stage to cycle back to the start, repeating the cycle automatically until stopped by the master switch. Visual and audible signals can be set up to monitor the whole process. **(216).**

Aeration Test Burner

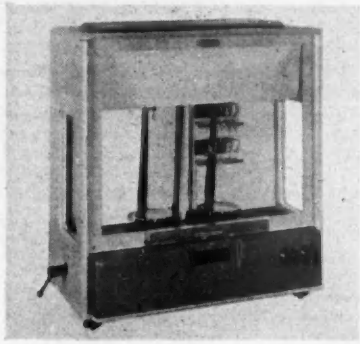
Among exhibits of Nash and Thompson Ltd., Oakcroft Road, Chessington, Surrey, is an aeration test burner for determining the combustion and flame forming properties of town gas. Electrical switches operated by liquid flow will be shown, as will a suppressed zero manometer and dead weight tester used for leak testing gas mains or sealed chambers. A micro hardness tester has been developed for measuring the hardness of extremely small rubber specimens. For the petroleum industry there is a new hand apparatus for Reid measurement of liquefied petroleum gases. **(105).**

New Oertling Balances

New one-pan and two-pan chemical balances, recently introduced by L. Oertling Ltd., Cray Valley Road, St. Mary Cray, Kent, are the result of extensive development work. Careful attention has been given to the positioning of controls, their ease of manipulation and the display of the weight reading.

The beams are made from one of the newer aluminium-magnesium alloys which are outstanding for their high resistance to corrosion and freedom from 'creep.' The use of light alloy casting and fabrication techniques has enabled a chassis form of construction to be employed which gives greater mechanical stability and a much higher degree of accuracy than was previously possible.

The balance case does not form part



Oertling's new Releas-o-matic (FO5) double-pan balance

of the instrument proper and the balance is totally enclosed leaving only the pans exposed. The improvement in stability as a result of the total enclosure of the beam has enabled the company to publish the accuracy of these instruments in terms of the standard deviation. **(616).**

Automatic Temperature Recorder/Controllers

Exhibits by the research and control instruments division of Philips Electrical Ltd., Century House, Shaftesbury Avenue, London WC2, will include a wide range of potentiometric recorders, a hand and clothing monitor for rapid checking of personnel who have been in contact with radioactive materials, a pulse analyser, a fast scaler, and a test set for routine testing for spurious pulses produced within nuclear counters

A demonstration will be given of an automatic temperature recorder/controller. The input signal to this potentiometric recorder is derived from a thermocouple in conjunction with a programme controller (PR 7211). The recorder has a full scale balance time of one second and a four-speed chart drive gear box. The programme controller enables a predetermined heating programme to be carried out in the small demonstration furnace, the complete heating cycle being recorded graphically on the chart. **(910).**

Temperature Recorders

Dial thermometers, recorders and controllers will be featured by the British Rototherm Co. Ltd., Merton Abbey, London SW19.

There are specially designed Rototherms for petroleum, chemical and most industrial applications. Now available are vertical models, the head of which has been re-tooled to incorporate several improvements in design with regard to the transmission and pointer drive.

Distant reading and rigid stem models, mercury-in-steel thermometers having 4 in., 6 in., 8 in. and 10 in. dials, for wall or panel mounting, in modern styled indicator cases will be shown.

Also on show will be mercury-in-steel temperature recorders of the single and dual pen type. These will include wet and dry bulb recorders, portable recorders,

and also the 'Talligraph' process batch recorder

A wide range of vapour pressure thermometers for industrial and other purposes having dials of 2½ in. to 8 in. will be displayed, as also single and dual pen pressure, vacuum and compound recorders, and pressure gauges (to match mercury-in-steel temperature recorders) **(928).**

Axial Flow Blowers

Intensive research conducted in the field of forced air cooling by Plannair Ltd., of Leatherhead, Surrey, has resulted in a new set of principles governing air flow and the movement of air generally being evolved. These principles have been employed in the company's range of axial flow blowers, which are notable for their high operational efficiency combined with small size. They may be used wherever forced air cooling or movement of air is required.

A number of the standard types of axial flow blowers, varying in size from 1.35 in. to 12 in. blade tip diameter will be featured, together with actual examples of their specialised application.

Another exhibit of interest will be the Mond Nickel demonstration unit, used to show the behaviour of different bi-metal strips when exposed to a stream of hot air. Fitted to the apparatus is a heater blower incorporating a 1.5 kW heater which raises the temperature of the air stream by 150°F. **(604).**

Digital Microsecond Chronometer

Designed to measure the time interval between two events with an accuracy of ±1 microsecond is the Racal microsecond chronometer type SA45 produced by Racal Engineering Ltd., Western Road, Bracknell, Berkshire.

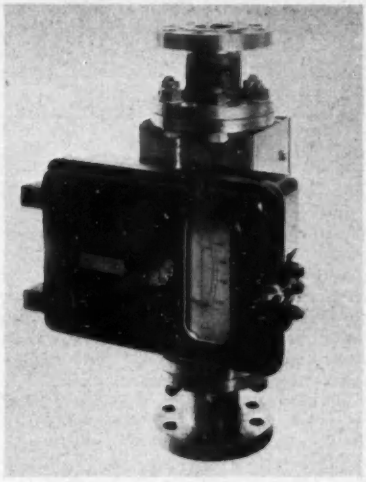
Direct reading visual display of the elapsed time interval is provided and the reading is held until the instrument is manually reset. Digital techniques are employed throughout, thus reducing to a minimum any possibility of ambiguity of result. Its range extends from 3 microseconds to 1 second. Longer time intervals can be measured on the standard equipment and, by the addition of a mechanical counter the display can be extended by as many as six additional digits. The SA45 may also be used as a counter and totalliser.

Time determining element in the SA45 is a temperature controlled crystal oscillator which operates at a frequency of 1 Mc/s with a stability of 1 part in 10^5. A pre-set control on the unit allows 'pulling' of the crystal. The 1 Mc/s output of this unit is fed to a unit type ASG12 which amplifies and shapes the 1 Mc/s sine wave giving at its output a train of pulses at 1 microsecond intervals.

Dimensions of the instrument ex-case are 19 in. wide, 15 in. deep, and 8¼ in. high. **(932).**

Flow and Density Meters

In the display of Rotameter flowmeters by Rotameter Manufacturing Co. Ltd.,



Pneumatic transmitting Rotameter

330 Purley Way, Croydon, Surrey, emphasis will be placed on those items available ex-stock, Among stock Rotameters special attention will be drawn to the metric series, based on interchangeable tubes and floats, which has been extended to cover flowmeter applications on nearly all liquids and gases. A number of Rotameters built for special duties will be shown and will include a working demonstration of flow ratio control by pneumatic method.

The RM continuous weighing density meter for liquids and slurries will be demonstrated as a working model; glass pipeline is used with p.t.f.e. bellows connectors. This instrument consists essentially of a loop of pipe carrying the flowing fluid weighed continuously on a pneumatic force balance Output range of 3 to 15 p.s.i.g. is linearly related to fluid density. Any liquid or slurry that can be piped may be metered, subject only to the limitations of the flexible connections.

The Ekstrom liquid level indicator will be shown working, the exhibit being fitted with the magnetic-coupled limit switches now available. All the hazards normally associated with gauge glass breakage are obviated in this indicator. Of simple design it is recommended for handling corrosive, toxic or inflammable liquids. **(935).**

Remote Reading Resistance Thermometers

A wide selection of new remote handling equipment and scientific instruments will be shown for the first time by Savage and Parsons Ltd., Watford, Hertfordshire. Of interest will be a range of what are claimed to be the most accurate remote reading resistance thermometers available commercially. These 400-hour battery operated thermometers have an overall accuracy of within plus or minus 1 degree, and a sensitivity of plus or minus 0.1 degree C allowing wide ranges of temperature variations to be accurately shown on the linear scale. They operate, with little time lag, on the temperature/resistance change of a platinum sensing element, and six models are available to cover the temperature range from −50°C to +250°C.

New remote handling equipment to be shown—all of which has been developed in collaboration with the AERE, Harwell, and are now available commercially for the first time—include master slave manipulators for handling highly radio active or toxic materials through protective screens or walls several feet thick (see CHEMICAL AGE, 9 March, page 430). **(302).**

Servis Recorder Charts

The Electric Servis recorder to be exhibited by Servis Recorders Ltd., 19 London Road, Gloucester, has been designed to give a clear reading on a chart to show when current is flowing in the installation to which it is wired. The types of systems where it will be used are:— Smoke control apparatus — thermostatically operated electric motors—alarm systems etc. It can be fitted with 12 volts a.c. coils, taking 1-5 watts and 30/40 milliamps, or with 12 volt d.c. coils operaed by a micro-switch. **(954).**

Stanton's New Single Pan Ultramatic Balance

The new single pan Ultramatic balance, to be introduced by Stanton Instruments Ltd., 119 Oxford Street, London W1, is the result of some years of research. With a large easily accessible pan, and a counter-indicator adjacent to the graticule screen, incorrect reading is said to be virtually impossible.

The Ultramatic incorporates a unique design of weightloading dials. Within the span of one hand, 200 grammes can be operated and controlled. The weighing time is given as less than 30 seconds.

Knife edges are of selected agate and the planes are of synthetic sapphire (corundum) optically flat to within 3 or 4 fringes of light. Knife guards are fitted to prevent accidental dislocation of beam.

Full external weight loading is up to

Stanton's new single-pan Ultramatic balance

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200 g. (UM 3 and 4) without use of loose weights or extra dials. Four weight loading dials (3 on UM 3) are arranged in two concentric banks on left side of balance at bench level. All weights are shown on the counter mechanism located on a base plate at the front of the balance. Colour indicators on the counter correspond to those on the weight loading dials. **(415).**

Chemical Industry Instruments

The exhibit by the Sunvic Controls Ltd., 10 Essex Street, Strand, London WC2, has been designed to show the comprehensive nature of the company's instrumentation service to industry with special emphasis on the oil and chemical industries and nuclear power and research reactors. Pneumatic and electrical instruments for measurement and control of flow, temperature, liquid level, specific gravity, and pressure will be displayed. A special feature in this section will be a demonstration model of plug-in controller constructed of Perspex to show operation; adjacent to this will be another rig showing the operation of Sunvic pressure regulators.

An instrument desk for a research reactor will also be shown.

The company also hope to exhibit new instruments for process control applications which they are developing.

The new 70/100 channel pulse height analyser 2, single and multipoint high speed chart recorders with examples of plug-in range change bobbins, d.c. amplifier and reference unit, and resistance thermometer controller will be shown. **(506).**

Vitreosil Products

High precision fused quartz tubes and rods of transparent Vitreosil can now be supplied precision ground on the external surface to an accuracy of plus or minus 0.0005 in. for instruments requiring stable electrical windings by the Thermal Syndicate Ltd., Wallsend, Northumberland. Examples will be exhibited. Other exhibits to be shown by this firm include a range of standard micro-combustion tubes for the determination of carbon and hydrogen, nitrogen, halogens and oxygen. Of particular interest is the Belcher and Ingram 'Empty Tube Method' for the rapid determination of carbon and hydrogen using a transparent fused quartz micro-combustion tube. Full details are given in *Analytica Chimica Acta*, 1950, **4**, 118; the British Standards Institution have approved the incorporation of this apparatus in BS 1428, Part A5, which is to be published.

Vitreosil filtering and ignition crucibles are fitted with sintered quartz porous discs which enable them to be used for filtering and subsequent ignition. The necessity for the use of asbestos mats is thus obviated resulting in greater accuracy and a considerable saving in time. They can be used for ignitions up to 1,000°C.

A greatly improved type of quartz helical spring is displayed in which the individual coils are perfectly circular and the fibre cross-section is uniform. Useful for microanalytical measurements, the springs can be designed to customer's own specification of maximum load, coil diameter and required sensitivity. **(514).**

Countercurrent Distribution Apparatus

The latest automatic model of the Towers counter-current apparatus will be shown by J. W. Towers and Co. Ltd., Widnes, Lancs. This new model accommodates 240 tubes on a single compact stand unit. This is stated to be the greatest number of tubes on any standard apparatus manufactured in Britain. The stand unit is controlled by a robot driving unit containing shaking and tipping mechanisms and the control panel.

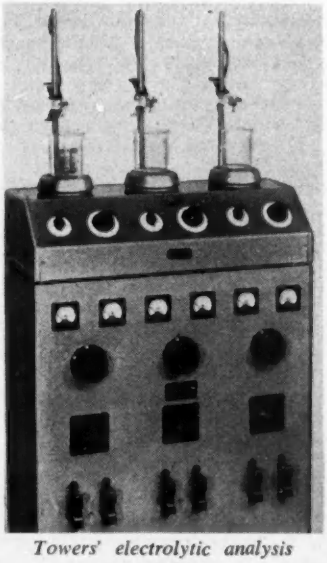
Also on show will be the Towers new range of electric muffle furnaces which has been designed to combine economical and dependable operation with pleasing appearance. Each furnace is self-contained with built-in energy regulator, controlling up to 1,000°C. Three standard sizes are available, all fitted with excess temperature safety fuse and a device for automatically switching off the current when the door is opened.

Towers electrolytic analysis apparatus, for use with stationary electrodes, consists of the analysis unit, containing the magnetic stirrer, speed control, 4 in. diameter hotplate with energy regulator and stainless steel tubes supporting the electrode holders. **(312).**

New Thermostat Bath

Unique new items will be exhibited by Townson and Mercer Ltd., Croydon, such as the S.200 Series IV thermostat bath. It is claimed that this gives the highest precision of any thermostat bath in the world, and has made possible the measurement of radioactivity by colorimetry. It gives a substantial accuracy, better than ±0.001°C and can be operated up to 120°C with oil.

Light alloy hotplates, with accuracy of thermostat control better than ±1°C will also be shown. By virtue of their accuracy these hotplates may be used for certain delicate work for which previously they have not been entirely suitable.



Towers' electrolytic analysis apparatus

A new type of high temperature oven will be exhibited which has direct radiant heat elements of great robustness. It will operate up to 450°C with marked evenness of temperature. **(614).**

Spectrometers and Goniometers

Central piece of the exhibits by Unicam Instruments Ltd., Arbury Works, Cambridge, will be the SP.100 double-beam infra-red spectrometer which offers fully automatic operation with recording facilities and includes several advanced features. Among these are an evacuable optical system, automatic interchange of prisms and cams, magnetic slits and star-wheel beam attenuation.

An advanced flame photometer, the Unicam SP.900, for the analysis of a wide range of elements in small concentrations, is of particular interest to clinical chemists. The use of a high quality monochromator with silica prism and variable slits makes it possible to eliminate substances that normally interfere. Careful design of the sample-handling system and the use of air and gas cylinders gives, it is claimed, a very stable flame.

For X-ray crystallography, Unicam offer a range of cameras and goniometers for all normal techniques including high temperature work. **(501).**

Measuring Conductivity

The Wayne Kerr Universal Bridge Type B.221 with adaptors for the measurement of conductivity and permittivity of liquids will be the main exhibit by the Wayne Kerr Laboratories Ltd., Roebuck Road, Chessington, Surrey. It is a highly accurate and sensitive transformer ratio arm bridge of advanced design. Special cells for the measurement of the permittivity of liquids with extreme accuracy have also been developed. With liquids of very low conductivity, contamination can often be more readily detected by measuring the change in permittivity. A jig for the measurement of permittivity of solids is also available. **(304).**

Stainless Steel Valves

Additions to the 'W and J' range of stainless steel reducing valves made by William and James (Engineering) Ltd., Gloucester, have been developed to meet requirements for a type for use where corrosive liquids or gases have to be handled. The valves are identical with the standard 'W and J' range except that the body and internal parts, normally coming into contact with the medium, are made from stainless steel.

Maximum downstream pressures remain unchanged, but the upstream pressures may be increased by up to two and a half times those of the standard valves according to the flow it is required to pass.

Another development by this company

is the Pneumerstat, a combined reducing valve and bubbler chamber, which, when used in conjunction with a manometer or low pressure circular scale indicator, measures the liquid content of tanks. It is stated to be a reliable instrument for gas purging. **(958).**

Thermometers and Hydrometers

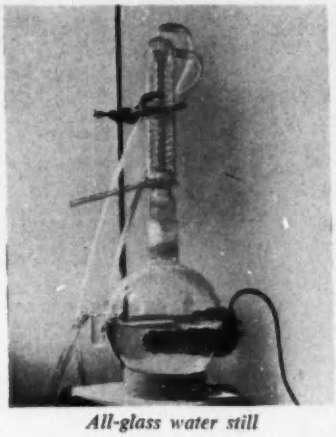
There will be a comprehensive display of instruments by G. H. Zeal Ltd., Lombard Road, Morden Road, Merton, London SW19. These will include thermometers and hydrometers made in accordance with the requirements of BS, IP, STPCT, and ASTM specifications. The range of temperature covered is from −200°C to +630°C. Instruments subdivided as finely as 0.01°C will also be exhibited. Stem thermometers incorporating interchangeable conical ground joints of various sizes will illustrate the wide range of these thermometers now available.

Also on show will be many hydrometers with arbitrary scales such as Beaume, Twaddell, Brix, Balling, Bates, API Sikes etc.

A special section of the exhibit is to be devoted to mercury-in-steel and vapour pressure dial indicating thermometers, recorders, controllers and manometers, to illustrate the wide variety of patterns that can be supplied. **(513).**

All-glass Water Still

Among exhibits of interchangeable laboratory glassware on the stand of Loughborough Glass Co. Ltd., Loughborough, Leics, will be complex pieces



All-glass water still

of apparatus such as Oldershaw fractional distillation columns. This section will include two new products. First, an all-glass water still, which represents a re-design of the company's former glass still. With an integral steam trap and condenser and fitted with an immersion heater, it produces four litres an hour of good quality distilled water. Second, p.t.f.e. sleeves developed for fitting to ground glass joints as an alternative to greasing. Sizes are available for all BS joints in the range B7-B55 inclusive.

New products in the industrial glassware section are heat exchangers with detachable coil units to facilitate cleaning and repair; and pressure relief valves, the operating parts of which are made in glass so they can be used in connection with corrosive materials **(512).**

ABCM Visit to Aero Research

MEMBERS of the Association of British Chemical Manufacturers' Trade Effluents Committee visited Aero Research Ltd., Duxford, Cambridge, on 17 April.

Resin manufacturing procedures used by Aero Research give rise to liquid organic wastes containing, among other substances, formaldehyde and methanol in solution with traces of sticky resin in suspension.

In the system adopted by Aero Research domestic sewage is pumped direct to the treatment plant while factory waste, which is bactericidal in character, is taken to a storage sump adjacent to the treatment plant.

The factory waste water is pumped from the lagoon at a controlled rate, diluted with clean water and treated in a diffused air activated sludge plant in conjunction with settled domestic sludge.

Surplus activated sludge which is produced is discharged to an adjoining field. Domestic sewage sludge is discharged to drying beds. The activated sludge plant effluent is chlorinated and passed to a storage and balancing pond.

The pond effluent is diluted with surplus clean condenser cooling water, discharged to a ditch about half a mile long and finally flows into the River Cam.

Part of the activated sludge plant effluent is diluted with clean water and fed on to two 40 ft. diameter experimental biological filters. BOD (biochemical oxygen demand) filter loadings similar to those normally employed with settled domestic sewage give filter effluents which, when settled, have a BOD of less than 20 p.p.m. The seasonal variation in performance of these filters is at present under investigation.

At the Aero Research works, l. to r., N. F. Patterson, Monsanto Chemicals Ltd., Dr. N. A. de Bruyne, managing director Aero Research, Dr. C. J. Jackson, The Distillers Co. Ltd.

Sulphuric Acid Tanks Destroyed in Fire

THERE was a fierce outbreak of fire at the 80 ft.-high sulphuric acid manufacturing plant at Esholt Sewage Works, Bradford, on 26 April, which caused damage estimated at £4,000-£5,000 and put the plant out of action. The blaze was seen two miles away by firemen racing to the scene. Water sprays were used instead of jets to fight the blaze because of the danger of nitrous and sulphuric acids boiling over and splashing the fire-fighters.

Within 20 minutes three lead-lined acid tanks had burst crashing down from the top of the tower. Nevertheless the flames were extinguished within an hour of the fire starting. The plant, which manufactures sulphuric acid for use in Esholt Sewage Works, was due to be closed in July for major repairs.

It is probable that the plant will not be in action again for another three months. Some 200 tons of sulphuric acid are used each week at the sewage works.

ICI Show Uses of Darvic PVC Sheet

AN EXHIBITION demonstrating the many uses that have been developed recently for Darvic p.v.c. sheet was staged this week by the plastics division of Imperial Chemical Industries Ltd., at Thames House, Millbank, London SW1.

Applications shown included the use of Darvic in chemical plant. Items displayed included fume ducting, cowlings over plating-vats and exhaust fans.

Shell Chemical to Supply Kleemann with Plastics

AN AGREEMENT has been reached by the Shell Chemical Company and O. and M. Kleeman under which Shell Chemical will supply O. and M. Kleemann with plastic materials which will be marketed under the Kleemann trade names.

A Kleemann subsidiary, Kleestron, which has been producing polystyrene, will now be supplied with this plastic from Shell Chemical's Partington plant of Styrene Products.

Although the Kleemann polystyrene plant at Welwyn Garden City will now cease production of polystyrene, Kleestron will continue to operate as an independent organisation marketing its products in the same way as it has done since it began production of polystyrene six years ago.

A full statement will be given by the chairman and joint managing director, Mr. D. Kleemann, at the company's annual meeting on 15 May.

UK Chemical Exports & Imports in Jan./Mar.

EXPORTS

		QUANTITY		VALUE	
		Jan./Mar. 1956	Jan./Mar. 1957	Jan./Mar. 1956	Jan./Mar. 1957
INORGANIC					
Acids	Cwt.	48,244	62,051	157,436	163,313
Copper sulphate	Tons	13,926	11,542	1,519,760	1,055,290
Sodium hydroxide	Cwt.	1,668,023	1,182,449	1,911,961	1,568,918
Sodium carbonate	,,	1,155,482	1,130,542	731,853	794,082
Aluminium oxide	Tons	4,018	9,953	130,606	327,929
Aluminium sulphate	,,	9,660	6,892	140,996	100,658
Other aluminium cpds.	,,	900	904	37,100	40,336
Ammonia	Cwt.	26,363	22,293	98,065	78,204
Ammonium cpds. (not fertilisers or bromide)	Tons	5,872	4,928	227,454	184,550
Arsenical compounds	,,	847	1,284	65,909	92,863
Bismuth compounds	Lb.	78,145	94,626	68,405	78,861
Bleaching powder	Cwt.	118,016	70,240	185,399	125,834
Hydrosulphite	,,	11,644	30,786	91,716	240,661
Other bleaching materials	,,	25,874	34,391	114,705	160,862
Calcium compounds	,,	79,060	86,346	160,184	179,329
Carbon blacks	,,	104,342	197,841	364,505	703,686
Cobalt compounds	,,	3,546	3,291	163,064	144,358
Iron oxides (chemically manufactured)	,,	24,572	23,572	84,174	70,702
Lead compounds	,,	9,013	9,513	59,707	62,307
Magnesium cpds. (nes)	Tons	3,327	4,380	171,970	216,307
Nickel salts	Cwt.	16,270	22,483	160,150	240,603
Potassium cpds. (not fertilisers or bromides)	,,	10,929	11,666	126,200	129,540
Sodium bicarbonate	,,	169,610	176,024	153,090	161,859
Sodium phosphate	,,	16,034	38,958	74,572	173,575
Sodium silicate	,,	89,261	92,834	77,212	82,768
Other sodium cpds.	,,	364,312	339,363	873,037	881,185
Tin oxide	,,	1,717	2,776	64,913	102,230
Zinc oxide	Tons	1,659	1,799	130,081	116,137
Other inorganics (nes)		—	—	1,149,504	1,262,592
ORGANIC					
Other than radioactive—					
Acids, anydrides, salts & esters		—	—	312,826	313,573
Glycerine	Cwt.	19,599	34,404	216,786	312,039
Ethyl, methyl, etc., alcohols and mixtures (nes)		—	—	289,737	376,438
Acetone	Cwt.	39,822	39,425	93,095	121,919
Citric acid	,,	8,457	17,036	85,276	162,823
Gases, compressed, liquid or solid (nes)		—	—	273,770	484,651
Phenol	Cwt.	31,871	38,142	194,187	251,428
Salicylates	Lb.	174,401	285,025	55,200	86,193
Sodium compounds	Cwt.	6,880	6,918	80,393	94,639
Sulphonamides, not prepared	Lb.	84,103	372,623	254,128	256,151
Dyestuffs intermediates	Cwt.	20,495	28,699	319,243	363,868
Organic compounds (nes)		—	—	3,460,423	4,001,200
Total elements & cpds.		—	—	**14,928,791**	**16,364,461**
Coal tar	Tons	25,017	25,019	231,379	251,418
Cresylic acid	Gall.	739,361	833,624	226,680	307,230
Benzol	,,	4,359	4,862	1,744	2,136
Creosote oil	,,	3,399,725	3,297,582	227,361	239,475
Other mineral tar & crude chems. from coal, petroleum & nat. gas	Cwt.	93,041	60,132	203,947	138,715
Pigment dyestuffs	,,	5,948	6,574	276,144	274,782
Other syn. dyestuffs & compounds	,,	46,661	55,108	2,049,161	2,494,798
Synthetic org. pigments	Cwt.	5,757	6,791	193,692	262,426
Veg. & animal dyeing extracts	,,	888	1,185	25,655	38,970
Tanning extracts	,,	32,075	36,228	143,434	163,935
Pigments, paints & varnishes		—	—	5,657,278	6,013,335
Drugs, medicines, etc.		—	—	9,189,582	9,838,949
FERTILISERS & OTHERS					
Ammonium nitrate fertiliser	Tons	1,874	366	59,060	12,310
Ammonium sulphate fertiliser	,,	16,484	5,217	317,721	99,104
Phosphatic and potassium	,,	—	—	20,532	15,045
Other manufactured fertilisers		—	—	180,793	171,797
Explosives		—	—	2,574,954	2,592,996
Insecticides, fungicides, rodenticides & weedkillers (ex 599)	,,	143,388	134,645	—	1,589,809
Carbons, decolorising or activated	,,	23,191	20,803	102,076	92,442
Tetra-ethyl lead anti-knock compound	Gall.	1,147,779	1,419,167	2,432,803	3,081,901
Other chemicals (nes)		—	—	3,355,718	5,120,775
PLASTICS MATERIALS					
Phenol & cresol formaldehyde resins	Cwt.	16,393	17,044	110,129	119,266
Urea formaldehyde resins	,,	65,896	67,192	294,378	332,230
Vinyl resins, unplasticised	,,	36,045	43,486	381,390	375,317
Vinyl resins, plasticised	,,	27,950	25,828	376,386	310,649
Other vinyl resins	,,	42,510	49,582	521,881	658,314
Moulding powders	,,	173,815	238,469	2,192,606	3,066,816
Sheet, rod, tube, film & foil	,,	68,836	69,023	2,107,450	2,192,629

IMPORTS

		QUANTITY		VALUE	
		Jan./Mar. 1956	Jan./Mar. 1957	Jan./Mar. 1956	Jan./Mar. 1957
INORGANIC					
Acids	Cwt.	26,556	25,510	75,333	75,284
Abrasives, artificial—					
Aluminium oxide abrasives	Tons	5,572	2,856	388,001	201,026
Silicon carbide abrasive	,,	3,432	1,865	343,704	191,328
Arsenic trioxide	,,	2,831	1,186	97,586	38,411
Borax, refined	Cwt.	129,950	145,237	239,433	279,877
Calcium carbide	,,	142,203	206,414	266,195	375,862
Carbon black (channel)	,,	44,892	54,972	255,693	313,590
Other carbon black (not acetylene black)	,,	37,983	21,412	149,076	82,975
Cobalt oxides	,,	1,407	591	885,082	36,941
Iodine	Lb.	259,773	490,942	131,235	189,123
Mercury	,,	272,677	369,909	307,049	432,089
Sodium, calcium, potassium, lithium	Cwt.	17,980	10,017	369,014	81,467
Potassium carbonate	,,	22,967	27,051	74,878	86,432
Other potassium cpds. (not fertilisers)	,,	19,637	29,394	87,848	130,947
Selenium	Lb.	47,569	52,115	212,044	278,698
Silicon	Tons	1,694	1,287	244,300	209,081
Sodium chlorate	Cwt.	30,328	30,572	93,832	100,526
Sodium phosphate	,,	2,738	1,343	12,643	8,051
Other sodium cpds.	,,	84,304	75,051	345,616	240,665
Inorganic chemicals (nes)		—	—	600,208	745,686
ORGANIC					
Acids, anhydrides & their salts & esters		—	—	498,557	394,225
Glycerine	Cwt.	25,379	19,238	198,675	118,573
Menthol	Lb.	14,488	69,956	32,266	149,633
Naphtha, methyl alcohol & alcohol mixtures		—	—	460,012	402,528
Turpentine	Gall.	109,714	53,959	30,689	14,728
Glycol ethers & esters	Lb.	1,980,702	1,679,724	170,430	159,190
Sodium cpds.	Cwt.	40,410	48,572	372,085	458,843
Styrene (monomeric)	Gall.	934,711	292,548	529,463	160,794
Vinyl acetate (monom)	Tons	1,943	1,479	281,881	174,248
Dyestuffs intermediates	Cwt.	2,335	8,433	106,668	288,643
Organic cpds. (nes)		—	—	3,489,159	2,855,318
Syn. dyestuffs & cpds.	Cwt.	7,807	9,345	644,567	768,687
Dyeing extracts	,,	3,516	6,277	19,095	47,187
Tanning extracts	,,	236,292	239,907	899,308	876,361
Pigments (inc. tit. dioxide)	,,	22,372	26,419	230,014	267,881
Other pigments, paints, etc.		—	—	156,659	244,708
Vitamins, their salts & esters		—	—	409,591	273,694
Antibiotics		—	—	120,045	328,602
Alkaloids		—	—	328,093	137,191
FERTILISERS & OTHERS					
Basic slag	Tons	37,735	44,218	298,833	361,431
Disinfectants, insecticides, weedkillers, sheep & cattle dressings	Cwt.	8,131	11,357	247,043	407,018
Potassium chloride	,,	3,381,778	3,259,064	2,782,983	2,796,098
Potassium sulphate	,,	110,667	108,505	112,277	111,846
Other fertilisers		—	—	268,547	803,372
PLASTICS MATERIALS					
Vinyl resins	Cwt.	35,504	37,063	502,372	530,103
Other syn. resins	,,	37,508	54,921	531,149	790,125
Moulding powders	,,	11,291	15,167	174,563	197,311
Sheet, rod, tube, film & foil	,,	32,616	35,575	1,476,522	1,663,618

EXPORTS OF CHEMICALS TO PRINCIPAL MARKETS

	Jan./Mar. 1955	Jan./Mar. 1956	Jan./Mar. 1957
	£	£	£
Nigeria	1,211,062	1,456,739	1,255,381
Union of South Africa	3,005,405	3,313,639	3,031,358
Rhodesia and Nyasaland	525,926	551,357	689,383
India	4,221,834	4,828,596	5,612,331
Pakistan	943,852	774,695	805,403
Singapore	1,003,803	1,018,711	1,182,502
Malaya	837,441	902,865	1,134,234
Hong Kong	917,321	768,323	1,125,382
Australia	5,058,521	4,253,722	4,745,995
New Zealand	1,921,659	1,652,268	1,804,782
Canada	1,379,796	1,603,491	1,528,994
Jamaica	520,329	709,202	615,971
Irish Republic	1,734,327	1,760,063	1,491,176
Finland	995,141	767,212	666,596
Sweden	1,509,275	1,503,459	1,854,713
Norway	782,721	909,662	1,132,909
Denmark	982,218	1,120,038	1,321,282
Poland	199,128	108,372	251,025
Western Germany	1,356,598	1,452,809	2,029,922
Netherlands	1,868,803	2,222,085	2,543,700
Belgium	1,339,559	1,336,165	1,728,469
France	1,926,968	1,580,919	2,721,756
Switzerland	700,445	856,254	911,666
Portugal	465,402	557,131	777,372
Italy	1,431,383	2,141,842	2,304,883
Turkey	246,755	564,005	347,359
Netherlands Antilles	780,519	650,854	795,442
Egypt	1,004,196	1,187,749	5,706
Iraq	538,408	759,370	802,105
Indonesia	611,317	861,797	922,915
China	753,310	143,481	398,956
Japan	289,775	373,847	677,740
United States of America	1,932,838	2,233,045	1,992,087
Argentine Republic	2,067,459	678,926	945,996
Other foreign countries	635,677	797,159	1,111,631

TOXIC HAZARDS IN INDUSTRY—9

Some Newer Metals and Metalloids

By

Peter Cooper, F.P.S.

SELENIUM has many industrial uses of its own, and it may inadvertently be encountered during the working up of copper, iron or other heavy metal ores. All the dusts, fumes, oxy-salts and gaseous derivatives of selenium are potentially toxic, so that proper ventilation and protective clothing are essential safeguards for workers exposed to them. The toxic absorption of selenium is commonly denoted by sore throat, nasal irritation and long-standing catarrh, with lumbar pain, garlicky breath and a metallic taste in the mouth. Prolonged exposure produces pallor (a sign of anaemia) and persistent gastro-intestinal upsets. During the chronic absorption of selenium dioxide dermatitis is common, and there may be a reddish coloration of fingers, teeth and hair, explained by the deposition of amorphous-free selenium in the tissues. The dioxide causes burns of the skin, which increase the subsequent absorption by the underlying tissues. Selenium oxychloride is a highly vesicant liquid, and precautions should be taken against splash-contamination with it, particularly in the eyes. The fumes of selenium itself and its oxides are pronounced lung irritants, and toxic absorption follows the preliminary irritation.

Selenium Metabolism

The metabolism of selenium in the body is obscure, but appears to be regulated by the liver, which becomes enlarged and sensitive to pressure during selenium intoxication. Selenium compounds are known to inactivate the sulphydryl enzymes. Free Se and methyl selenide are end-products in tissues, and it is the alkyl compound that is responsible for the characteristic odour of the breath and sweat in selenium poisoning. Stores of free Se are laid up in the liver, and exert a local pathological effect. Selenates are converted to selenites, which are greater depressors of tissue oxidation than their precursors. Urinalysis serves to detect the excretion of an abnormal quantity of selenium, and thus excessive absorption. If symptoms arise, contact with the offending material should be interrupted until the level of Se excretion returns to normal. The treatment of symptoms alone is possible. The administration of bromobenzene or arsenites has the effect of increasing selenium elimination, but these compounds are not suitable for routine therapy.

Tellurium may also occur in smelting operations with copper or lead, and may be a constituent of special alloys. Some electrolytic refining processes may produce hydrogen telluride gas. The inhalation of tellurium as oxide fumes or gaseous derivatives leads to dryness of the mouth and skin (unlike selenium, tellurium suppresses sweating), a metallic taste in the mouth, and a garlicky breath. The garlic odour, which also attaches to the urine, is particularly powerful and offensive. Tellurites are powerfully haemolytic and produce marked anaemic pallor. They appear to be eliminated by the kidney in the form of volatile methyl telluride, which is responsible for the odour. Free Te is less toxic than its oxy-compounds. Dimercaprol injections may be used to increase the elimination rate of tellurium, but they also increase the unpleasant odour of breath and urine. This odour can be reduced by the oral administration of ascorbic acid (vitamin C) daily; presumably this reduces the body compounds to free tellurium *in situ*. The treatment of poisoning is solely symptomatic. Only massive doses of tellurium are likely to endanger life by causing liver degeneration.

Vanadium, often associated with lead, occurs in heavy metal ores and in the residues from burning petroleum fuels. The metal is used in hard alloy steels, and the pentoxide is a versatile catalyst in many oxidation processes. The pentoxide in particular is irritant, provoking conjunctivitis and bronchitis, a dry cough and catarrh. Giddiness, excessive fatigueability and a sense of constriction in the chest are symptoms of over-exposure. There is often excessive expectoration, and a dangerous and sometimes fatal complication of vanadium intoxication is bronchopneumonia.

Ingestion or inhalation of vanadium dusts produces a loss of appetite and weight, anaemic pallor and gastric upsets. Hysteria, melancholia, disturbances of vision and other neurological symptoms may arise. The sharp, fine crystals of sodium vanadate, a common intermediate, are intensely irritating to the lung mucosa, and their inhalation should be guarded against. There is a greenish-black discoloration of the tongue which appears during vanadium intoxication, which is probably due to the enzymic reduction of pentoxide derivatives to those of the trioxide. In animals, the green colour has been observed in the stomach lining also, where it is associated with pathological changes. Little can be done about vanadium poisoning, except removal from further exposure.

Beryllium has been included in many important new alloys, in electrical rectifiers, heat-refractory materials and phosphors for fluorescent tubes. The grave dangers inherent in the accidental inhalation or traumatic injection of beryllium phosphors has led to their replacement in Great Britain by the less toxic halophosphates. Exposure to soluble beryllium compounds causes conjunctivitis and dermatitis, which clear up rapidly when the patient is removed from further exposure. The same compounds irritate the nose and throat, causing nose-bleeding and bronchitis. Associated with these may be the loss of appetite and shortness of breath. These symptoms usually subside after two to three weeks when exposure to beryllium is discontinued. The dermatitis produced by beryllium or its salts may prove very severe, and it is thought that true sensitisation is a factor in some cases. The skin lesions heal only if further contact with beryllium is rigidly avoided. Injections of cortisone acetate or corticotrophin (ACTH) are sometimes used to hasten recovery.

There are serious hazards involved in the introduction of beryllium alloys or beryllium compounds beneath the skin. Subcutaneous granulomas are readily formed which require surgical excision. Unless all traces of beryllium are removed from the wound, healing may be long delayed. A notable cause of such granulomas has been the breaking of fluorescent tubes in such a way as to wound the operator, or the embedding of slivers during the machining of beryllium alloys with precious metals. The same effect follows the entry of beryllium dusts into healthy minor wounds or abrasions. The most serious and long-term effects follow the inhalation of dusts into the lungs. Both the dust and the fumes of beryllium metal and its oxide have caused pneumonitis in metallurgical workers, and have shown that beryllium itself, and not the toxic anions often associated with its industrial use, is responsible for the intoxication.

Early Symptoms

Early stages of poisoning are marked by cough with blood-stained sputum, chest-pain, shortness of breath, cyanosis and the progressive loss of appetite and weight. The difficulty in breathing, at first experienced only on exertion, later becomes noticeable even when the patient is at rest. There is rarely any sign of fever. With dangerous degrees of exposure, the patient is liable to die within two weeks of the development of symptoms. In most cases, however, the lung lesions start to heal within three weeks, although they may take as long as five months to disappear. Acute berylliosis is sometimes followed after a long latent period by the symptoms of chronic poisoning.

Chronic exposure to beryllium dusts produces a lung condition closely resembling sarcoidosis, which is distressing and disabling. Sometimes it may appear as long as six years after the last known toxic exposure to beryllium. The persons at risk, if dust-suppression is not adequate, include not only workers and laboratory technicians but residents in the neighbourhood of a factory handling beryllium. The development of chronic berylliosis in roughly one in twenty of the persons at risk suggests that individual predisposing factors play their part. The

earliest warning signs are a persistent loss of appetite and weight, lassitude and abnormal fatiguability, and a persistent catarrhal condition of the upper respiratory tract. It is only after the condition has been established for weeks or months that abnormal chest radiographs are obtained. The severity of the cough has no direct relationship to that of the lung lesions. The sufferer is disabled by a rapid heart-rate and extreme breathlessness and in the later stages of the disease the fingers may appear clubbed. Only about one-third of affected patients recover completely. Another third remain permanently disabled in circulatory and respiratory functions, while the remaining third die.

Clinical differential diagnosis from simulating conditions is only possible if it is established that the patient has been exposed to beryllium compounds. No specific anti-measures are available against berylliosis in humans, though it has been found that the toxic effects of injected beryllium sulphate in animals may be reduced by sodium salicylate or by the water-soluble ammonium compound of salicylamide. Dimercaprol injections have met with no success in human berylliosis. Oxygen inhalations are palliative in patients with great respiratory embarrassment, and the risk of secondary bacterial infection of the affected lungs can be reduced by using aerosol inhalations of antibiotics, particularly penicillin and streptomycin.

Cadmium Alloys

Cadmium alloys, when strongly heated during recovery treatment or welding, readily evolve the brown fumes of cadmium oxide The inhalation of these fumes appears to be far more dangerous than absorbing cadmium salts in solution or as coarse dust. Cadmium fumes irritate the eyes, and produce headache, dizziness, nausea, dry throat, cough, chest pains and weakness of the leg muscles. Other delayed effects include feverishness and shortness of breath. Chronic cadmium poisoning involves respiratory embarrassment by reason of the lung irritation, with severe nasal irritation which may totally destroy the sense of smell. A distinctive protein (m.wt. 20,000 to 30,000) often occurs in the urine of affected persons. Longstanding exposure to cadmium promotes a yellow line in the teeth, a sign which denotes absorption, but not necessarily at toxic level. Any toxic intake of cadmium irritates the gastro-intestinal tract and chronic intoxication leads slowly to liver degeneration.

The only effective measure against poisoning by cadmium is adequate ventilation wherever cadmium-containing alloys or compounds are heat-treated. The administration by mouth or injection of di-sodium calcium edetate (EDTA) has a theoretical interest; although in experimental animals it mobilises the body cadmium and increases its excretion rate, it appears to increase the hazard to the kidneys when used against chronic poisoning. In acute poisoning by cadmium, it is nevertheless possible that oral di-sodium calcium edetate might be of value.

Osmium itself is apparently harmless, but the tetroxide, readily formed by oxidation of the spongy metal, causes extreme irritation of the mucous membranes of nose, pharynx, bronchi and conjunctiva. High concentrations temporarily paralyse respiration, presumably reflexly. Lachrymation and headache commonly follow even very moderate exposure to the vapour; the headache is probably a direct effect on the linings of the nasal sinuses. Another characteristic feature of osmium poisoning is the appearance of coloured haloes round bright lights. Osmic acid, which blackens fats and oils, causes a dermatitis on contact with the skin of some persons. The continued handling of volatile osmium compounds may give rise to cough. Although no permanent ill-effects seem to follow exposure to osmium, the acute reactions persist for as long as 24 hours.

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New Red Pigment For Plastics by Geigy

A NEW ORGANIC red pigment, Ingalite red HBL for use in plastics, particularly p.v.c., has been marketed by the Geigy Co. Ltd., Rhodes, Middleton, Manchester. It is said to have properties similar to Ingalite red HGL, introduced by Geigy late last autumn, but is slightly bluer in shade.

In plastics, it is claimed that Ingalite red HBL gives pigmentations of exceptional fastness to light and heat in both opaque and transparent shades, even at tint concentrations. Shade and properties, like other colouring materials, are affected in some degree by the use of different polymers, p.asticisers, stabiliser systems, etc. Variations, however, are very slight. In plasticised p.v.c. compounds, it is highly non-migratory, although in some systems, wet rubbing may occur.

According to Geigy the pigment shows light and heat stability and non-migration in unplasticised p.v.c., polystyrene, polythene, cellulose acetate and other high polymers.

It is stated that Ingalite red HGL and Ingalite red HBL are both equally suitable for use in pigment rubber.

Catalytic Combustion of Noxious Fumes by Holmes-Catco Process

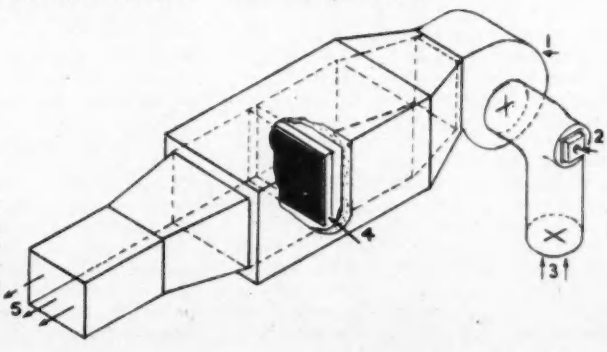
THE CHEMICAL engineering division of W. C. Holmes Ltd., Turnbridge, Huddersfield, is to manufacture and market the Holmes-Catco process for the catalytic combustion of noxious fumes. Only recently introduced into this country, the process treats fumes, vapours, gases and odours of an organic nature produced by a wide range of chemical plants.

Catalytic combustion is the low temperature, flameless oxidation of combustible fumes and is applied to greatest advantage where the available energy is substantially below the lower limit of flammability. It has no minimum fuel limits, and the oxidation temperature is no more than 500°F approximately. The temperature rise of the fumes passing through the catalyst element is proportional to the concentration of combustible material which they contain. Heat liberated per unit quantity of hydrocarbons is the same as with flame combustion.

The catalyst element is a frame on which a narrow heat and corrosion resistant nickel alloy ribbon enclosed between heat resistant alloy container screens is mounted; a coating of certain metals of the platinum group is bonded to all surfaces of the nickel alloy ribbon to form the catalyst. Elements of standard dimensions are used and can be grouped to handle any desired volume of fumes. The pressure drop across a complete assembly is low, being of the order of ¼ in. to ½ in. w.g. Dust particles normally present in the atmosphere have no clogging effects on the catalyst. If large amounts of sand, fly ash, and similar substances are present, they must first be removed.

In many cases the hot oxidised gases contain more heat than is required for operating the Holmes-Catco plant. This heat can be utilised in the process producing the fumes, such as an air heated oven, or recovered in a waste heat system.

The usual life of an element before re-activation is necessary varies from 1½ years to 3 years continuous running, depending on the nature of the application. Re-activation of a catalyst element is carried out by Holmes.



(1) *Circulating or exhaust fan* (2) *Fuel burner or electric heater* (3) *Fume entry* (4) *Catalyst element* (5) *Oxidised fumes*

Overseas News

EURATOM PRODUCERS PLAN STANDARD NUCLEAR EQUIPMENT

MANUFACTURERS in the six Euratom countries are now working out plans for the standardisation of nuclear equipment. It is being assumed, it is understood, that a wide range of products will be available for manufacture under licence from American and British patent holders. This aspect will be somewhat clearer after the report of Euratom's 'Three Wise Men' (see CHEMICAL AGE, 2 March, p. 386 and 9 March, p. 415) is published; this is expected within two weeks.

Ratification of the Euratom treaty by the six Parliaments is expected by early autumn this year and will officially come into force within six weeks of the last ratification. Within a year after this import duties and quotas will have been dropped between the six nations and a common external tariff established for most types of nuclear equipment. Arrangements for putting a tariff wall round nuclear equipment manufacture in the Six are to come into being at a much earlier date than the general provisions of the Common Market.

External tariff for uranium, thorium and plutonium, their ores and principal chemical compounds containing them will be at the lowest rate applying in any member-country at the beginning of this year.

Tariff-fixing negotiations for heavy water and apparatus for its production; apparatus for isotopic separation, the treatment of waste, fuel re-cycling and chemical treatment of radioactive materials, vehicles for transport of highly radioactive matter; remote handling apparatus and artificial radioactive isotopes, are to begin within three months. Should the duties not be agreed, these will be fixed by a majority vote of the Council of Ministers.

Other materials and equipment listed are to be dealt with under the ordinary Common Market procedure, although this may be speeded up for any item which is required in the development of nuclear energy in Euratom countries. Restrictions on internal trade in these products can be waived by production of a Euratom certificate indicating their intended use in nuclear projects. This list includes lithium, bismuth, zirconium, calcium and some other metals, important chemical compounds of the same metals, glucine, artificial graphite, Geiger counters, certain other measuring apparatus, linear accelerators, diphenyl, triphenyl, and anticontamination shields of various descriptions.

Vinyl Stearate as Copolymer

New addition to Air Reduction Chemicals' acetylene-based chemicals will be vinyl stearate. Some of the 2-million lb.-per-year vinyl stearate capacity, will be used by Airco to make polyvinyl stearate, a hard synthetic wax.

Biggest potential outlet for vinyl stearate will be as copolymer with vinyl acetate, particularly for exterior paints, since the compound forms a tough flexible film with marked resistance to water. Because of its relatively high price, the product must be considered in the speciality class.

W. German Chemical Imports Increase

Chemical imports into West Germany increased 10.4 per cent to about DM 1,340 million in 1956, compared with 1955 imports, the West German Association of Chemical Industries reports. Imports of chemical raw materials rose by five per cent to DM 268 million; imports of semi-finished and finished products increased by nearly 13 per cent to DM 1,070 million. Greatest increase in imports occurred in plastics which increased by 30 per cent, to DM 89 million.

Industrial chemical products only rose by 3 per cent to DM 193 million as domestic production has greatly increased recently.

Main supplier was Switzerland. The US and Canada supplied some 27 per cent of imports and the remainder, 58 per cent, was obtained from European countries.

Italian Interest in Moroccan Phosphates

Ing. Fagioli, a noted Italian specialist in phosphate mining, will accompany Mr. Mattei, president of ENI, on his visit to Morocco early this month.

Union Carbide Change Name

Net earnings for the first quarter of 1957 announced by Union Carbide and Carbon Corporation are $1.18 per share ($1.25 initial quarter 1956).

This company has now changed its name to Union Carbide Corporation.

Niobium Developments at Panda Hill

Rapid development of the Panda Hill niobium-bearing pyrochlore deposit near Mbeya, Tanganyika, has been made by the Mbeya Exporation Co. Ltd., a company owned jointly by NV Billiton Maatschappij and the Colonial Development Corporation.

A pilot mill with a capacity of 150-200 tons of ore a day will, it is anticipated, be operating about August 1957. It is reported that it now seems certain that many millions of tons of ore exist in this deposit.

Scandinavian Tariff Changes Being Negotiated

Substantial progress is reported in negotiations for a Customs Union between the Scandinavian countries. Plans for unification of tariffs in Scandinavian countries were drawn up in the autumn of 1954, and summarised in a preliminary report in January 1955 A more detailed report is expected by June of this year.

Some seventy-seven per cent of commodities in inter-Scandinavian trade have been studied by the joint committee set up by Denmark, Norway and Sweden and now joined by Finland Customs duties and restrictions on 33 per cent of these goods would have little significance. Chemical products account for 10 per cent.

The aim of the committee is to create a common table of tariffs vis-à-vis outside countries on the basis of the Brussels nomenclature. It will be based mainly on *ad valorem* tariffs. Denmark has the lowest and Norway the highest tariff level, with Sweden in between. It is considered that the common tariff will have a level corresponding approximately to that of the present Swedish ones.

It is thought likely that tariffs and import restrictions will be abolished in inter-Scandinavian trade in respect of those groups of goods on which agreement can be reached.

Research Reports of US Armed Forces

Three reports of research by the US armed forces in the field of chemistry have been made available for industry through the Office of Technical Services, US Department of Commerce, Washington 25, DC. The first (PB 121541, price $1.25) suggests industrial applications for phosphorescent and fluorescent materials. The second (PB 121131, price 75c) discusses the kinetics of the steam-carbon reaction. The report describes the first kinetic study of the reaction in which the oxidising gases have been preheated to the reaction temperature. Possible mechanisms are discussed and an apparatus is described for the study of high temperature, low pressure heterogeneous processes in which one or more products are gases.

In the third report (PB 121058, price $1.25) is a summary of work on the production of diamond, graphite and subgraphitic carbons through transformation and other mechanisms.

Bofors Building a New Nicotinic Acid Plant

Bofors (Great Britain) Co. Ltd., 81 Gracechurch Street, London EC3, state that their parent company, AB Bofors, Sweden, to meet increasing overseas demand for nicotinic acid, both as a pharmaceutical raw material and a flour enricher, have decided to increase their production. To this end they are erecting a new plant at Bofors, Sweden, which, with a capacity of 300 tons a year, will be in production by the end of 1958. When this plant is in operation, Bofors output

of iso-nicotinic acid and iso-nicotinic acid hydrazide will also be materially increased. In addition, the company intends to start production of nicotinic acid amide during 1958.

Conference on Moplen

A special meeting on Moplen was organised at the recent International Samples Fair in Milan. Manufacturers of plastics products discussed with the technicians of the Montecatini Company the possibilities of using Moplen (CHEMICAL AGE, 27 April, page 713). Present plans indicate that Moplen will be marketed at about 850 lire (10s) per kg. This is a normal price in Italy for materials of this kind, but in view of its low specific gravity (0.9) a kilogramme of Moplen yields about 1,100 cc. of material as compared with some 700 cc. produced by a kilogramme of rival materials.

It is reported that the intensive propaganda conducted at the Milan Fair in favour of the new plastics material has alarmed some producers of other plastics. However, the consumption of plastics in Italy is climbing at the rate of 20 to 30 per cent every year and in 1956, 110,000 tons of plastics materials were produced. Thus, there is room for new materials, such as Moplen, which, as reported, is resistant to heat and acid etc.

Freeport Sulphur Plans Nickel and Cobalt Plant

A nickel and cobalt refining plant is to be set up by the Freeport Sulphur Co. near Braithwaite, Louisiana, US, with a capacity of 50 million lb. of nickel and 4.4 million lb. of cobalt acetal annually which is expected to quadruple US output of nickel. Combined facilities in New Orleans and Cuba (new ore and concentrates facility) is to cost about $100 million. Production of concentrates is expected in 1959.

OTS Paper on Viscosity of Organosilicon Compounds

'Determination of the mechanism of the increase of viscosity of organosilicon compounds at high temperature' is the title of a paper published by the Office of Technical Services, US Department of Commerce, Washington 25, DC (Order PB 121717, price 75 cents). An apparent close correlation between oxidative stability and chemical structure was revealed by data on the effects of oxidation on isometric tetrapentoxysilane compounds.

It was shown that compounds with the greatest stability towards hydrolysis had only intermediate stability towards oxidation. These compounds may, however, be stabilised by antoxidants and should be the most stable silanes towards oxidation and hydrolysis, the paper states.

German Potash Production and Exports

Production of West German potash (K_2O) in 1956 at 1,734,000 tons was 10 per cent up on the previous year. The home market took 949,000 tons in comparison with 898,000 tons in 1955 and exports rose from 680,000 tons (in 1955) to 786,000 tons last year.

The rise in home consumption is a direct result of the Government's fertiliser subsidy scheme. The increased exports have resulted in the main from efforts to open up new markets in Venezuela, the Philippines and other parts of the Far East. Exports to Germany's traditional markets (UK, Denmark, Belgium, Holland, Sweden, Japan and the US) were maintained.

Of the 30 pre-war German potash producers, only 10 are situated in the Federal Republic. The main post-war development in the industry has been undertaken by seven producers situated in Lower Saxony at an estimated cost of over DM20 million. The seven companies account for more than 60 per cent of total German potash production.

Italian Chemical Companies Overseas Ventures

It is reported that the Montecatini chemical group of Italy which has built plants in Canada, Japan, the Netherlands, India, Venezuela, Colombia and other countries, is considering building a large chemical plant of its own in the US, and other plants in partnership with local interests, in Mexico and in Canada. Another Italian chemical concern, the Carlo Erba company has recently opened a plant in Indonesia.

Carbide and Carbon Double Ethanolamines Capacity

A new ethanolamines unit that more than doubles Carbide's ethanolamines capacity is now on stream at the Seadrift, Texas, plant of Carbide and Carbon Chemicals Co., a division of Union Carbide and Carbon Corporation. This additional capacity for ethanolamines now makes it possible for Carbide to supply ethanolamines from two sources—Seadrift, Texas, and South Charleston, West Virginia. This expansion also makes it possible to supply more ethanolamine derivatives. Already, Carbide is doubling its capacity for producing morpholine, which is made by dehydrating diethanolamine. Further expansions are to be expected in an integrated pattern of growth.

The new facilities at Seadrift are designed to provide an adequate supply of ethanolamines to meet the growing demand for these compounds.

Gibberellic Acid Available as K Salt

Merch and Co. Inc., have now marketed in the US the potassium salt of gibberellic acid under the trade name Gibrel. Initial trials with Gibrel indicate that treatment of roses, geraniums and other flowering plants with Gibrel rapidly results in increased growth two or three times that of comparable untreated plants. Gibrel has been made available for commercial sale in the US. There are no supplies through the Merck subsidiary, Merck Sharp and Dohme Ltd., in the UK except for investigational use.

IG Farben Shareholders Approve Compensation

Shareholders of the IG Farben trust now in liquidation have approved the payment of £2½ million compensation to Jewish prisoners who were slave workers in their plants during the war. About 7 per cent of the shareholders voted against making the payment.

Dutch Synthetic Rubber Plant being Planned

Establishment of a large synthetic rubber plant at Pernis, near Rotterdam, is being discussed by Royal Dutch Petroleum, whose large refinery is situated there. It is expected that an announcement will be made soon.

Chairman of the Netherlands Association of Rubber Manufacturers spoke about the project on 29 April in Amsterdam. The plant would be the first of its kind in the country.

Berk's Wages Bill Rose by £36,000, but no Substantial Output Increase

THE AMOUNT paid out last year to manufacturing workers of F. W. Berk and Co. Ltd., chemical manufacturers, 1-19 New Oxford Street, London WC1, rose by £36,000. There was no substantial increase in output to set against that. This is stated by Mr. A. D. Berk, chairman, in his annual report to be presented at the annual meeting on 16 May.

The prices of raw materials and services as well as the cost of local taxation again rose steeply. Mr. Berk adds that the 1957 Budget contained nothing to help the manufacturer and that the firm is still faced with the bitter fact that 12s 6d out of every £1 of distributed profit is taken by direct taxation. He says that to deliver their goods, motor fuel tax calls for an annual contribution of approximately £43,000.

He could not forecast the effect of the latest increase in wages of 1 April which in turn will reflect itself in further rises in the cost of raw materials and services. He expresses the hope that 'our new processes, coupled with continued improvement to the old ones, should enable us to maintain our level of profit.'

As expected, the benefits from new Sandridge Works began to materialise only late in the year. The associated company, Abbey Chemicals Ltd., remained in the development stage. One plant started operations and the second is in course of being built. It may be some time before a dividend can be expected from this source.

Profits for 1956 were £251,913, against £359,806 as stated in CHEMICAL AGE, 20 April, page 682. The reduction in earnings was accounted for by reduced profit on manufacturing operations; increased turnover on the merchanting side has kept the level of profits comparable with 1955.

BOC DEVELOP FREEZE GRINDING TECHNIQUE FOR PLASTICS

FREEZE GRINDING, a new technique based on the fact that many materials acquire unusual properties when cooled to low temperatures, has been developed recently. The process is said to be particularly suitable for materials which are volatile or sensitive to heat or oxidation, materials such as foodstuffs containing oils, to pharmaceuticals and to plastics like p.v.c. where normal methods are slow and tend to produce particles rather ragged in appearance.

Field trials in Britain, initiated by British Oxygen Research and Development Ltd., Deer Park Road, London SW19, have used stainless steel high-speed hammer type mills fed by cooled particles from a heat exchanger to which the liquid nitrogen is fed from a small transporter by dry nitrogen gas cylinders.

The photograph (right) shows plant installed by Dohm Ltd., Surbiton, Surrey, for carrying out freeze grinding trials on polythene and nylon.

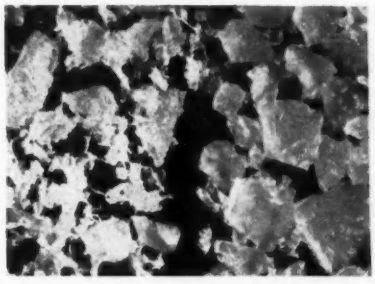
At bottom right can be seen the regulator dial of a nitrogen cylinder. Nitrogen is fed from this cylinder into the liquid nitrogen transporter which is heavily insulated. When gaseous nitrogen is fed into the transporter liquid nitrogen is forced up the corrugated pipe into the heat exchanger.

Particles to be ground are contained in the hopper (top). They are allowed to fall through the heat exchanger into the grinding mill beneath. At the same time some cold gas from the heat exchanger passes up through the hopper.

Ground granules from the mill pass downwards into a drum. Fine dust is collected in the cloth bag.

Most of the experimental work has been carried out on polythene and nylon which are not easily powdered without generating enough heat to cause molecular degradation. The most promising results were obtained with nylon. Ignoring capital outlay, a cost analysis indicated that nylon could be processed for an increase of 12 per cent on the raw material cost. It was demonstrated that, if ground at ambient temperature, the throughput of nylon is less than one-eighth of that of the low-temperature process. Hence, although the prime cost is lower with normal methods, the burden of on cost should favour the use of freeze grinding.

While freeze grinding is not expected to reduce costs among the more friable materials, new products and processes, dependent on small particle size, may be expected to be developed in many industries. For, it is claimed, it is now possible for the first time to obtain many materials in finely divided form.



The photograph shows, left: polythene granules ground at normal temperatures, right: polythene granules ground with liquid nitrogen. The freezeground product is more uniform and of better quality

Exemptions from KID

THE FOLLOWING materials are exempted from Key Industry Duty for the period 29 April to 18 August 1957 by a Treasury order under section 10(5) of the Finance Act 1926:

Compounds of rare earth metals, the following: Cerium oxide, pure.

Synthetic organic chemicals, analytical reagents, other fine chemicals and chemicals manufactured by fermentation processes, the following: 4-Aminophenol, the aminophenol content of which exceeds 97 per cent by weight, azelaic acid, beryllium oxide, creatine (a substitution derivative of guanidine), 4:4′ diaminodiphenylmethane (an aminodiphenylmethane) of a purity not less than 97 per cent, dimethyl 2:2:2-trichloro-1-hydroxyethylphosphonate (a methyl ester), diphenyl, 2-ethyl-4-methylpentanol (an octyl alcohol), isatin, *trans*stilbene.

ICI's Offices Plans Approved

Plans for the erection of multi-storeyed offices for Imperial Chemical Industries Ltd., Bilfingham, have been approved by Billingham-on-Tees Urban Council. The building will be 300 ft. long, 65 ft. wide and 120 ft. high, constructed in reinforced concrete.

Chemists No Longer Badly Paid, Says Dr. Kent Jones in Presidential Address

'AS RECENT remuneration statistics show, chemists in general are no longer badly paid; on average, their salaries probably compare not unfavourably with those of members of many other learned professions.' This was stated by Dr. D. W. Kent-Jones in his presidential address to the Royal Institute of Chemistry at the Senate House, University of London, recently.

The subject of his address was a review of the present position of the profession of chemistry.

Today chemistry was one of the really important professions, said Dr. Kent-Jones. It had great and increasing responsibilities and on the work of its members rested to a large extent the future prosperity of the country.

In a brief survey of the growth of the Institute, Dr. Kent-Jones said that at the first meeting of the Institute in February 1877, 48 chemists were elected fellows. The roll of corporate members today as given in the report of the council, was 14,641, showing an increase of 663 for 1956.

The hope was expressed that the Institute and its work would be supported in a better manner in future by all suitably qualified and experienced chemists.

Recent developments in the activities of the Institute were noted. It was pointed out particularly that the Institute's work in the field of professional and status was of increasing range and importance. The latest, and perhaps the most important, of new developments was the establishment of the Royal Institute of Chemistry Fund for the Development of Education in Chemistry.

Up to now, Dr. Kent-Jones considered the publicising of the attractions of chemistry as a career had been lacking due to inadequate funds or personnel for the purpose. The Institute now intended to produce first-class careers books, as well as films and special monographs on various features of chemistry and its applications, which should assist science teachers and which would bring to their pupils some of the glamour of the chemist's rewarding work.

New Plant for Murex

Murex Ltd. has decided to proceed with the construction of an entirely new plant for the production of pure tantalum and niobium powders at its Rainham works. Foreseeable user requirements for these two products during the next few years should be met when the plant is in production. It is not expected that the plant will be operating until 1959. Present demands are being met by the existing plant which has developed from extensions to the pilot plant.

People in the NEWS

● MR. H. C. WORSDALL, former hon. secretary of the London section, Oil and Colour Chemists' Association, was elected chairman at the annual meeting on 25 April. Other officers elected were: hon. treasurer, DR. S. R. W. MARTIN (re-elected); hon. secretary, M. R. MILLS; hon. publications secretary, J. A. HAWKEY (re-elected); hon. programmes officer, A. T. S. RUDRAM; hon. auditor, W. H. CAMPBELL (re-elected); committee, DR. R. H. LEACH, W. GILLISON and J. B. LEWIN.

● MR. S. R. COOK, works manager of the Widnes Plant of Fison's Ltd., fertiliser manufacturers, has been presented with a watch for long service. He has been connected with the company for 37 years. The gift was handed to him by MR. J. W. STEVENTON, production controller. Mr. Steventon himself received a long service award three weeks ago from the chairman of Fisons Ltd.

● MR. D. J. HARDIE (British Petroleum) was re-elected chairman of the Graduates' and Students' Section, Institution of Chemical Engineers, at the annual meeting on 27 April. Other officers elected were: hon. secretary, H. W. D. HUGHES (chemical engineering department, University College, London); assistant secretary, J. N. BENGE (W. J. Fraser and Co. Ltd., Harold Hill), hon. treasurer, DR. S. R. G. JEWELL THOMAS (Sunbeam Anti-Corrosives Ltd.).

Mr. T. A. Winney (left), home sales manager, Price's (Bromborough) Ltd., talking to Professor Victor K. La Mer, department of chemistry, Columbia University, New York. The occasion was a conference called recently by Price's to announce the development of a new process for the manufacture of hexadecanol in uniform beads for the conservation of water (CHEMICAL AGE, 20 *April, p.* 668)

● Among the passengers in the *Queen Elizabeth*, which sailed from Southampton for New York on 25 April were MR. ELIOT WARBURTON, chairman and managing director of William R. Warner and Co. Ltd., London; MR. B. C. HUGHES of Hughes and Hughes Ltd., chemical merchants, London; and MR. ROBERT I. WISHNICK, chairman of the Witco Chemical Co., New York.

● The British Welding Research Association announces that DR. RICHARD WECK, Ph.D., has been appointed director of research as from the 17 June. Dr. Weck took an honours degree in civil engineering at Prague University in 1936. He came to England in 1938, and spent the next four years with the Electric Furnace Company and Campbell and Gifford. He was appointed to the staff of the Welding Research Council in 1943. Seconded to Cambridge University engineering department he worked for the Admiralty on problems of residual stresses on ships' structures, for which work Dr. Weck was awarded the degree of Ph.D.

● MR. R. M. MCFARLAND has been appointed product manager-plastics for the FMC organic chemicals division of Food Machinery and Chemical Corporation. He will be located at the New York headquarters of the division.

● MR. E. A. S. ALEXANDER has been appointed deputy chairman of the United Glass Bottle Manufacturers. He has relinquished his appointment as managing director. New managing director is MR. R. W. J. ROWLEDGE. The appointments became effective from 1 May.

● Progress of the sales expansion scheme of Bowmans Chemicals Ltd., Widnes, particularly with the Far East, was reviewed by MR. W. H. BELLAMY (sales director) when he proposed the toast to the firm at the third annual staff dinner. Guests were received by MR. E. G. TURNER (chairman) and M. S. H. W. PERT (managing director). Mrs. Pert handed to Mr. H. Mousdell (maintenance foreman) an inscribed gold watch in recognition of 35 years' service with the company.

● MR. A. W. SCOTT, managing director of Shawinigan Ltd., Marlow House, Lloyds Avenue, London EC3, has been elected to the board of directors of Shawinigan Chemicals Ltd. Mr. Scott joined Shawinigan Ltd. in 1924, five years after the wholly-owned subsidiary of Shawinigan Chemicals was incorporated to act as sales agent for the parent company's products in Europe. He has been managing director since 1948.

● For the first time the American Society of Cosmetic Chemists' special award for outstanding scientific literature in the field of cosmetics technology has gone outside the US. The winners are DR. A. J. P. MARTIN and DR. A. T. JAMES who share the $1,000 award together with $600 travelling expenses for their work on gas chromatography and liquid-liquid extraction. Dr. Martin is a joint Nobel Prize winner in the same field, sharing the honour with DR. R. L. M. SYNGE. He also holds the Berzelius Gold Medal of Sweden. Formerly with the Dunn Nutritional Laboratory at Cambridge, the Wool Industries' Research Association, Boots and the National Institute for Medical Research, he now heads his own scientific organisation. Dr. James is now at the National Institute for Medical Research which he joined in 1950. Previously he worked with Dr. Synge at the Lister Institute.

● DR. LEWIS M. BRANSCOMB, chief of the atomic physics section at the US National Bureau of Standards, has received one of the nine 1956 Rockfeller Public Service Awards. He is the third NBS scientist to receive this reward, which was established five years ago. Dr. Branscomb will spend the academic year 1957-58 in residence at the department of physics, University College, London. He plans to make a critical survey of the physics of negative ions and low energy ionic collision phenomena.

● DR. LEO A. WALL, a chemist at the US National Bureau of Standards, has been presented with the Arthur S. Flemming Award, given annually to 10 outstanding young men in Government. Dr. Wall is recognised as an authority in the field of polymerisation chemistry.

● SIR IAN CLUNIES ROSS, chairman of the Commonwealth Scientific and Industrial Research Organisation, is the first Australian to be presented with the gold medal of the Royal Agricultural Society of England. The medal was presented for his distinguished services to agriculture.

● MR. ERIC MENSFORTH, C.B.E., M.A., has been appointed to the board of Costain-John Brown Ltd., chemical engineers etc., Roxby Place, London SW6.

● Appointment of MR. W. ADRIAN KING as general sales manager of the industrial chemicals division of Olin Mathieson Chemical Corporation was announced on 24 April. Mr. King was previously manager of the division's automotive products department.

● MR. A. L. HADFIELD has relinquished the office of secretary of the Anchor Chemical Co. Ltd. and has been succeeded by MR. R. G. WRIGHT. Mr. Hadfield continues as financial director of the company.

● MR. JOHN F. SYNAN and MR. WALTER W. NORTHGRAVES have been appointed to the market development department of the industrial chemicals division, Olin Mathieson Chemical Corp., Baltimore, US, where they will specialise in the textile, pulp and paper, and leather industries.

● MR. P. L. POCOCK has been appointed general manager of the engineering division of Sheepbridge Equipment Ltd., a subsidiary of Sheepbridge Engineering Ltd.

FOR YOUR DIARY

MONDAY 6 MAY

SCI (London Section)—London: 14 Belgrave Square SW1, 6.30 p.m. 'The combustion of coal' by A. C. Monkhouse. Preceded by annual general meeting of London section.

Bradford Chemical Society—Bradford: Technical College, 7 p.m. Annual general meeting.

CS—Cambridge: University Chemical Laboraotry, Lensfield Road, 8.30 p.m. 'Enzymic syntheses of higher saccharides' by Professor E. J. Bourne.

TUESDAY 7 MAY

SCI (Corrosion Group)—London: 14 Belgrave Square SW1, 6.30 p.m. Annual general meeting and chairman's address 'A pilgrim's progress from corrosion' by T. H. Turner.

WEDNESDAY 8 MAY

SCI (Corrosion Group)—London: 14 Belgrave Square SW1, 11 a.m. Educational panel annual general meeting.

SCI (Food Group)—London: 14 Belgrave Square SW1, 6.45 p.m. Annual general meeting, followed by the retiring chairman's address 'Food, food science and the food group—a 25 year review' by Dr. A. J. Amos.

THURSDAY 9 MAY

CS—London: Burlington House, Piccadilly W1, 7.30 p.m. 'Structural evidence regarding the solid addition compounds of ethers and amines with halogens and other molecules acting as electron acceptors' by Professor O. Hassel.

SCI (Microbiology Group)—Nottingham: Visit to antibiotics and fermentation division of Boots Pure Drug Co. Ltd. (also on Friday 10 May).

Royal Society—London: Burlington House, Piccadilly W1, 4.30 p.m. Meeting for election of foreign members, followed by 'Chemical research at the Atomic Energy Research Establishment' by R. Spence.

FRIDAY 10 MAY

CS and Birmingham University Chem. Soc.—Birmingham: Chemistry Department, The University, 4.30 p.m. Centenary lecture, 'Structural evidence regarding the solid addition compounds of ethers and amines with halogens and other molecules acting as electron acceptors' by Professor O. Hassel.

SAC (Midlands Section)—Birmingham: Mason Theatre, The University, Edmund Street 3, 7 p.m. Discussion, 'Micro-determination of functional groups' followed by 'Some developments in the analysis of functional groups' by W. I. Stephen, 'The determination of N-methyl groups' by M. K. Bhatty, 'The determination of equivalents' by T. S. West and 'Titrations in non-aqueous media on the submicro scale' by T. S. West.

Market Reports

TRADE STILL ACTIVE

LONDON Business in most sections of the market has been fairly active and the volume of inquiry for shipment has been well maintained. Contract deliveries to the home consuming industries have been resumed on a normal scale and buyers are showing more interest in covering their forward requirements. There have been no important price movements on the week and for the most part quotations are steady. There is little of fresh importance to record in the coal-tar products market. Cresylic acid continues to be in active demand and there is a strong pressure for deliveries of xylol.

MANCHESTER Firm price conditions characterise virtually all sections of the Manchester market for heavy chemicals. Leading industrial consumers, including the textile and allied trades, are calling for steady deliveries under contracts, and a fair number of fresh inquiries from both home users and shippers have been reported during the past few days. There has been little change in the fertiliser trade and supplies are moving fairly well in most sections.

GLASGOW During the past week business has been very brisk in the Scottish heavy chemical market, and a fairly wide range of chemicals has been in demand. Contract requirements have been well taken up. On the agricultural side, considerable activity can be reported in keeping with seasonal demands.

Commercial News

ICI Profits Down on Higher Sales: Dividend Stays at 6 per cent

INCOME of Imperial Chemical Industries Ltd., after tax, for 1956 was £19,293,139 (£23,977,163). Value of sales for the year was £435 million (£411 million). With a final dividend on ordinary of 6 per cent, total payment is maintained at 10 per cent.

Group income before tax was £50,121,439 (£53,579,085), after charging £23,459,049 (£20,379,824) for depreciation and providing £3,146,643 (£2,833,467) for employees' profit sharing bonus. UK tax amounts to £23,764,834 (£23,900,433). £750,000 has been released from revenue reserve (stock replacement) against an appropriation of £3 million in 1955, and added to income available for appropriation.

£7 million (same) has been allocated to capital reserve (obsolescence and replacement of assets) and £2,500,000 (£3 million) to capital reserve (general).

Final ordinary dividend will be paid on 29 June. Annual meeting will be held at Wigmore Hall, London W1, on 13 June.

Albright and Wilson

During 1956 group capital expenditure of Albright and Wilson Ltd., chemical manufacturers, exceeded £2.5 m. of which about half was devoted to expansion in Canada, states Mr. K. H. Wilson, chairman. This year it is planned to spend about £3 m. on projects due for completion during the next two or three years.

Sales were higher in 1956, but rising costs prevented earning corresponding increases in profits. Consolidated trading profits, including those of the Marchon Products group, were £4,416 m. (£3.2 m.). Dividend of 18 per cent (same) is announced on capital increased to finance the Marchon Products purchase.

Following an amalgamation of US companies, Albright and Wilson received 378,000 units (out of 450,000 $5 units) in Hooker Electrochemical Co.

As part of an internal re-organisation, the manufacturing activities in the past carried on by Albright and Wilson Ltd. have been transferred to a wholly-owned subsidiary company, Albright and Wilson (Mfg.) Limited. All contracts made between suppliers and Albright and Wilson and all orders placed by the company have been taken over by Albright and Wilson (Mfg.).

Bakelite Ltd.

At the annual meeting of Bakelite Ltd., Mr. H. V. Potter, chairman, stated that the company has been building up a market for polythene based on imported resins. This policy was adopted in anticipation of the time when the company would have for sale the whole of the output of the new plant at Grangemouth which was being constructed by the company's associates, Union Carbide.

British Alkaloids

Final dividend announced for British Alkaloids, is 16¾ per cent making 26¾ per cent for the year ending 31 March 1957 (same equivalent), which absorbs £20,930 net. Profit, after all charges, but subject to final audit, is £21,320, (£24,513). Tax £36,600 (£34,150).

Davy British Oxygen Ltd.

A new joint company, Davy British Oxygen Ltd., of Bridgewater House, Cleveland Row, St. James's, London SW1, has been formed and will make available to the steel industry 'oxy-steel' processes utilising the steel plant manufacturing resources of Davy and United Engineering Co. Ltd., Sheffield and the metallurgical techniques and tonnage oxygen plant manufacturing facilities of British Oxygen Engineering Ltd. and British Oxygen Linde Ltd.

The increased use of oxygen for metallurgical duties brought about by the low cost resulting from production on tonnage scales has led to the development of new steelmaking processes, which bring together the metallurgical techniques involved in the design of steelmaking plant with the application of tonnage oxygen.

Capital of the new company (£10,000 in £1 shares) will be held equally by Davy and United Engineering and the British Oxygen Co. Directors will be Mr. M. A. Fiennes and Mr. M. F. Dowding (Davy and United) and Dr. P. H. Sykes and Mr. F. J. Clark (BOC).

It is reported that the new company has already received a large number of enquiries.

Distillers Co. Ltd.

Following the offer made by the Distillers Co., on 30 March to holders of the preference and preferred ordinary of certain subsidiaries, the company have now announced that holders of more than 90 per cent of the total nominal value have accepted.

The company has allotted £9,069,622 5½ per cent consolidated unsecured loan stock in exchange. Allotment letters were posted 26 April. The period for acceptance has been extended until 8 May, when a further allotment will be made.

Evans Medical Supplies Ltd.

An increase in sales by Evans Medical Supplies Ltd., in 1956 just failed to compensate for reduced margins and increased expenses, Mr. I. V. L. Fergusson, the chairman has reported. The new manufacturing unit at Speke is now in production, but high depreciation and the cost of transfer of plant has placed a heavy burden on 1956 profits. Group manufacturing and trading profit, after overseas tax, was £362,922 (£373,321) Ordinary dividend is 10 5/6 per cent (same). However, the previous year's interim was on smaller capital.

Howards' Thorium Tie-Up

A note in the *Investor's Chronicle* on Howards and Sons (19 April) reveals that this company holds 40 per cent of the £140,000 ordinary capital of Thorium Ltd.; Imperial Chemical Industries Ltd. holds 50 per cent. As only the £20,000 preference capital has voting rights, Howards' half-share in this class, gives the company equal say with ICI in the management.

Some thorium materials are being supplied by the company to the Atomic Energy Authority and plans are under way to supply potential demand.

Lacrinoid Products

The dividend of Lacrinoid Products for 1956 has been announced as 10 per cent, the same as for 1955. Net profit was £18,445 (£20,475) after tax of £9,000 (£14,000).

Simon-Carves Ltd.

Simon-Carves Ltd. announce a final dividend of 12½ per cent on ordinary, making 20 per cent on the present capital (against an interim of 11¼ per cent on £525,000 and a final of 17½ per cent on £1 m.). Group profits amounted to £1,374,024 (£1,385,041). Net profits were £665,749 (£629,488).

Tharsis Sulphur and Copper Co.

Net profit of the Tharsis Sulphur and Copper Co., for 1956 was £216,454 (£225,040). Dividend of 12½ per cent (same) is announced. Current assets £2,545,276 (£2,858,178) and liabilities £931,157 (£1,175,189).

Telegraph Construction and Maintenance

Profit attributable to shareholders of the Telegraph Construction and Maintenance Co. (Telcon) after taxation was £226,677 for the year ended 31 December 1956, compared with £286,595 for the previous year. Final dividend of 3¾ per cent is to be paid, together with a cash bonus of 1 per cent on the ordinary shares as in 1955. Group profit before taxation declined by 7½ per cent despite an increase in turnover of 14 per cent.

United Glass Bottle Manufacturers

Group trading profits of United Glass Bottle Manufacturers for 1956 are reduced from £1,414,312 in 1955 to £1,257,725. Dividend, however, is maintained at 11¼ per cent with a final announcement of 7½ per cent. Group net profit is £526,257 (£689,981).

UGB froze selling prices for a period of at least six months despite mounting costs of all descriptions. The company also had a serious fire at one of the works.

NEW COMPANIES

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NEW PATENTS

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Specifications filed in connection with the acceptances in the following list will be open to public inspection on the dates shown. Opposition to the grant of a patent on any of the applications listed may be lodged by filing patents form 12 at any time within the prescribed period.

ACCEPTANCES

Open to public inspection on 12 June.

Processing of rubber. Du Pont de Nemours, E. I., and Co. **776 101**

Catalysts containing molybdenum. Universal Oil Products Co. **776 102**

1-(*p*-aminophenyl) - 3 - aminopyrazolines and their production. Farbenfabriken Bayer AG. **776 322**

Modified polystyrene moulding compositions. Monsanto Chemical Co. **776 499**

Dehairing. Rohm and Haas Ges. **776 323**

Lubricating oil composition. Esso Research and Engineering Co. **776 221**

Fungicidal composition. Geigy, J. R., AG. **776 223**

Merocyanine dyes. Kodak Ltd. **776 414**

Chemical plant including a continuously operating liquid circulation system. Shell Research Ltd. **776 415**

N-tert-alkylaminoalkyl esters. Rohm and Haas Co. **776 503**

Cold separation of gas mixtures. Naamlooze Vennootschap Philips' Gloeilampenfabrieken. **776 417**

Cooling hot gaseous suspensions. Du Pont de Nemours, E. I., and Co. **776 419**

Polymerisation of dienes having terminal ethylenic unsaturation. Du Pont de Nemours, E. I., and Co. **776 326**

Fluorocarbon carbonyl fluorides. Minnesota Mining and Manufacturing Co. **776 507**

Carbocyanine dyes. Kodak Ltd. **776 050**

Coating surfaces with an adherent film of metallic silver. Olin Mathieson Chemical Corp. **776 508**

Gas analyser. Foxboro Co. **776 112**

Beta - hydroxy - ethylhydrazine. Olin Mathieson Chemical Corp. **776 113**

Heterocyclic compounds. Union Carbide and Carbon Corp. **776 423**

4, 5, 6, 7, 10, 10-Hexachloro-4, 7-methylene-4, 7, 8, 9-tetrahydroindane-sulphonic-(X) acid and its acid amide derivatives. Ruhrchemie AG. **776 510**

Breaking petroleum emulsions. Badische Anilin- und Soda-Fabrik AG. **776 329**

Compositions of polymeric alkenyl aromatic hydrocarbons and monovinyl aromatic hydrocarbon-butadiene copolymers. Dow Chemical Co. **776 511**

Anhydrous alkali-metal carbonates in granular form. Badische Anilin- und Soda-Fabrik AG. **776 331**

Anthrapyridone dyestuff. Sandoz, Ltd. **776 513**

Polystyrene moulding compositions. Koppers Co. Inc. **776 333**

Chlorination process. Chempatents Inc. **776 334**

Octahydro-pyridopyrimidine compounds. Hoffmann-La Roche and Co. AG. **776 335**

Fungicidal preparations. Berk, F. W., and Co. Ltd. **776 234**

Non-phytotoxic agricultural compositions. Esso Research and Engineering Co. **776 235**

Heterocyclic compounds. Wilde, W. **776 118**

β-Aminobutyric acids and esters and salts thereof substituted on the nitrogen atom. Henkel and Cie, Ges. **776 121**

4-Estrene-3, 17-diol, 17-substitution products, esters thereof. Searle, G. D., and Co. **776 427**

Reduction of metal chlorides. St. Joseph Lead Co. **776 124**

2, 2'-Methylene-bis-4, 6-dialkylphenols. American Cyanamid Co. **776 518**

2-Chlorodioxime. Olin Mathieson Chemical Corp. **776 126**

Making continuous fibres from a normally crystalline polymer latex. Dow Chemical Co. **776 521**

Herbicidal compositions. Esso Research and Engineering Co. **776 237**

3 : 5-Dioxo-pyrazolidines bicyclically substituted in the 4-position. Geigy, G. R., AG. **776 136**

Lithium calcium grease compositions. Esso Research and Engineering Co. **776 525**

β-Chloro styrene. Deutsche Gold- und Silber-Scheideanstalt Vorm. Roessler. **776 239**

N-(2-Hydroxyalkyl) alkylene bisdithiocarbamates. Dow Chemical Co. **776 339**

Lysergic acid derivatives. Sandoz Ltd. **776 140**

Polymeric sulphochlorides. Gasper, B. [Divided out of 746 043.] **776 044**

Separation of gases. Osterreichische Stickstoffwerke AG. **776 641**

Phosphonitrogenous fertilisers. Soc. Anon. des Manufactures des Glaces et Produits Chimiques de St.-Gobain, Chauny et Cirey. **776 968**

Dioxypropane compounds containing mercury. Ciba Ltd. **776 776**

Uniform distribution of liquid substances in mixtures thereof with solids. Bergwerksverband zur Verwertung von Schutzrechten der Kohlentechnik Ges. **776 599**

Pyridazones. Ciba Ltd. **776 759**

Halogen pyridazines. Ciba Ltd. **776 760**

Ceramic-to-metal bonds. General Electric Co. **776 970**

Alloys of magnesium. United Kingdom Atomic Energy Authority. **776 649**

Treatment of low loss ceramic materials. British Thomson-Houston Co. Ltd. **776 822**

Recovery of tin or tin dioxide from materials containing tin in an oxidic form. Naamlooze Vennootschap Billiton Maatschappij. **776 602**

Hydrogenation of carbon monoxide in a liquid medium. Rheinpreussen AG Fuer Bergbau und Chemie. **776 781**

Glass-to-metal seals. British Thomson-Houston Co. Ltd. **776 972**

Continuous compacting of powdered metallic materials. National Research Development Corp. **776 544**

Sulphides and polysulphides, and lubricant compositions containing same. Anglamol Ltd. **776 660**

Polyoxypropylene-polyoxyalkylene surface-active agents. Wyandotte Chemicals Corp. **776 661**

Gas detection method and apparatus. Mine Safety Appliances Co. **776 770**

Manufacture of honeycomb cell structures. Aero Research Ltd. **776 973**

Neoprene cement. Firestone Tire and Rubber Co. **776 827**

Cyclopentanopolyhydrophenanthrene derivatives. Organon Laboratories Ltd. [Cognate application 24215.] **776 830**

Fluid density measuring apparatus. Rotameter Manufacturing Co. Ltd., and Stephenson, E. F. **776 926**

Organic metal salts. Esso Research and Engineering Co. **776 548**

Glass compositions. British Thomson-Houston Co. Ltd. **776 784**

Process for removing acids from aqueous solutions of organic solutes with ion exchange resins. Dow Chemical Co. **776 664**

Tunnel-shaped hollow bodies exposed to a stream of gaseous medium. Von Zborowski, H. P. G. A. R. **776 835**

Means for preventing freezing in domestic and like water systems. Haddleton, P. J. **776 870**

Low temperature stability of synthetic lubricants. Esso Research and Engineering Co. [Cognate application 20694.] **776 669**

Synthetic rubber-like materials prepared from polyesters on polyester-amides and polyisocyanates. Imperial Chemical Industries Ltd. **776 979**

Manganese salts of chromium complexes of monoazo dyestuffs and use in lacquers. Imperial Chemical Industries Ltd., Giness, R. B., and Twitchett, H. J. **776 873**

Lubricant additives and lubricants containing them. Esso Research and Engineering Co. **776 874**

Apparatus for cleansing liquid containing tanks or vessels. British Miller Hydro Co. Ltd., and Handyside, J. B. **776 675**

Purifying a cuprous salt catalyst in the synthesis of acrylonitrile. Ciba Ltd. **776 676**

Diphenylol methanes. Union Carbide and Carbon Corp. **776 790**

Solvent extraction and filtration process and apparatus therefor. Rose, Downs and Thompson Ltd. **776 938**

Apparatus for steam production. Badische Anilin- und Soda-Fabrik AG. [Addition to 768 656.] **776 791**

Shaped polyacrylonitrile containing articles such as filaments. American Cyanamid Co. **776 678**

Compositions suitable for making refractory articles. Metropolitan-Vickers Electrical Co. Ltd., and Monsanto Chemicals Ltd. **776 616**

Gas/liquid contact devices. British Oxygen Co. Ltd. **776 942** and **776 794**

Method and apparatus for continuously producing thermoplastic organic synthetic plastic sheets having polished surfaces. Szantay, E. **776 986**

Triazine derivatives and compositions containing them. Imperial Chemical Industries Ltd. **776 679**

Method of removing adherent metallic salt from transition metals. Horizons Titanium Corp. **776 562**

Photographic emulsions. Imperial Chemical Industries Ltd. **776 945**

Method of destroying catalyst residues. Esso Research and Engineering Co. **776 682**

Manufacture of hydrogen peroxide. Laporte Chemicals Ltd. **776 991**

Method for carrying out the oxidation of olefinically unsaturated compounds. Du Pont de Nemours, E. I., and Co. **776 757**

Aryl magnesium chloride complexes. Metal and Thermit Corp. **776 993**

Activation of ferroelectric ceramics. American Lava Corp. **776 568**

Manufacture of titanium. Imperial Chemical Industries Ltd. **776 739**

High molecular weight alcohols. Esso Research and Engineering Co. [Addition to 761 024.] **776 998**

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The commercial product containing 40 per cent. boron trifluoride is a pale yellow or brown, rather viscous liquid. It fumes slightly in moist air and is decomposed by water.

On heating, boron trifluoride is evolved until the strength is reduced to 36 per cent. BF_3 corresponding to the compound $BF_3 \cdot 2CH_3COOH$. This then distils unchanged at 140°C.

On cooling, the 40 per cent. BF_3 complex becomes very viscous below 0°C., but does not freeze even on prolonged standing at −10°C.

BORON TRIFLUORIDE GAS

Used as a catalyst in polymerisation, alkylation, condensation, and other organic reactions.

As a gaseous flux in metal brazing.

CHEMICAL PROPERTIES

The dry gas does not react with metals at room temperatures.

It forms a hydrate $BF_3 \cdot 2H_2O$ with water, and readily forms complexes with oxygen-containing organic compounds, e.g. ethers, phenols, alcohols, acids and aldehydes.

PHYSICAL PROPERTIES

The following published data refer to the pure product:

Boiling point	−101°C.
Freezing point	−128°C.
Critical temperature	−12·25°C.
Critical pressure	49·2 atmos.
Density of gas	3·06 gms./litre at S.T.P.

Commercial gas contains not less than 98·5% BF_3

High Purity gas contains not less than 99·8% BF_3

CONTAINERS

Steel cylinders 5-6 lbs. or 40-45 lbs. net capacity at 1,800 lb./sq. in. pressure.

Advice on materials of construction and on handling may be obtained from

PRODUCTS OF IMPERIAL SMELTING

CONSOLIDATED ZINC CORPORATION (SALES) LTD · 37 DOVER STREET · LONDON · W.1

PIONEERS IN FLUORINE DEVELOPMENT

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